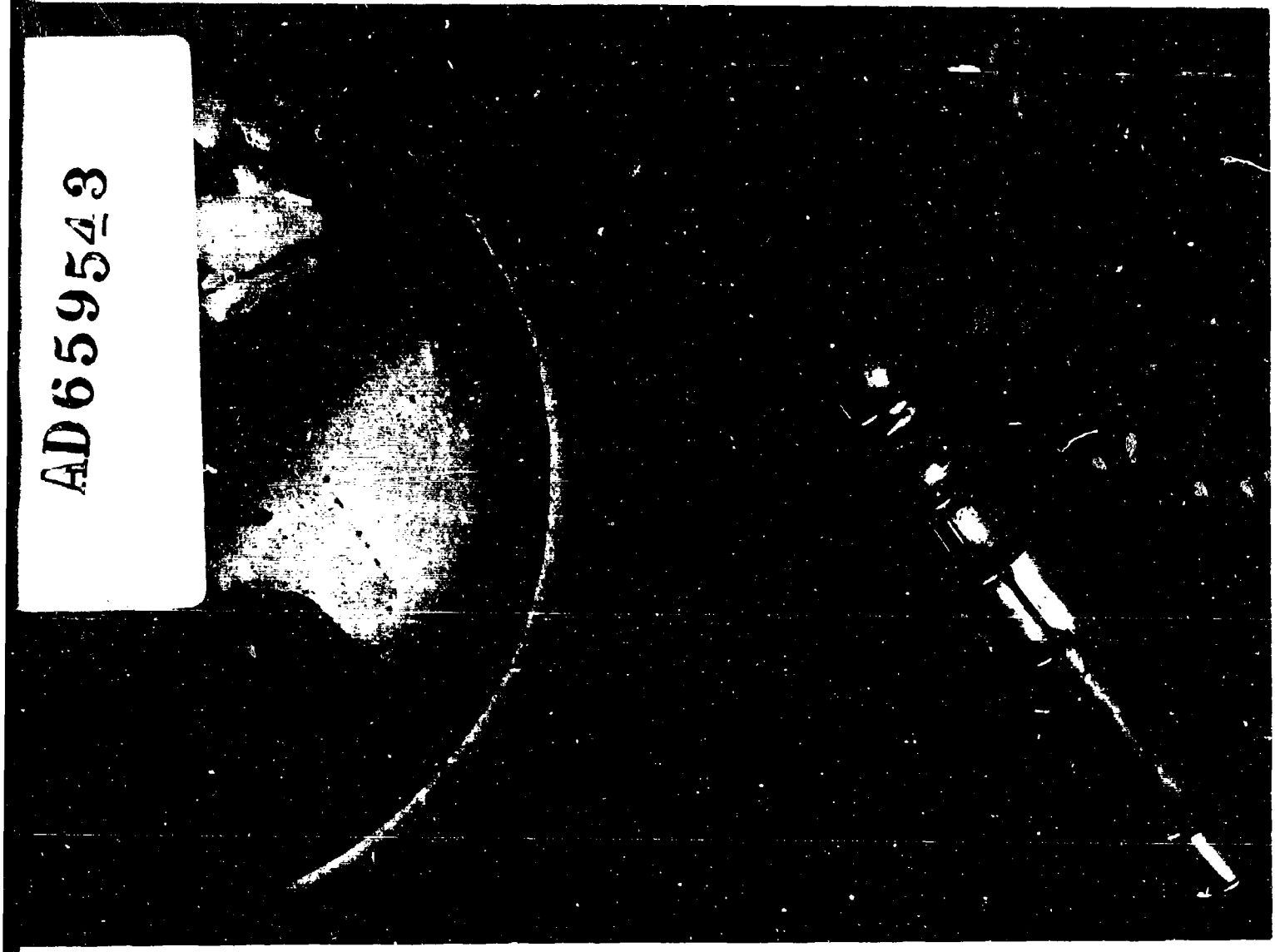
U.S. STANDARD ATMOSPHERE SUPPLEMENTS, 1966



Prepared under sponsorship of
ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
UNITED STATES AIR FORCE

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Abstract

The *U.S. Standard Atmosphere Supplements, 1966* was prepared in response to a need for atmospheric tables depicting conditions other than the mid-latitude mean represented by the tables of the *U.S. Standard Atmosphere, 1962*. Tables of typical winter and summer conditions for various latitudes are provided for the troposphere, stratosphere, and mesosphere. The models merge into three sets of boundary conditions at 120 kilometers in the lower thermosphere. Models starting from these boundary conditions then branch upward into atmospheric profiles which are related to the wide range of conditions in the heterosphere associated with varying solar activity, geomagnetic activity, and zenith angle of the sun.

The substance of this publication is two major sets of tables: those for the region below 120 kilometers, keyed to seasonal and latitudinal variations; and those for 120 to 1,000 kilometers, keyed to solar and geomagnetic activity and solar angle. These two sets of tables, though separated, have mutual boundary conditions so that users will be able to select for any location, season, and solar activity the appropriate continuous profiles from the surface up to 1,000 kilometers. Profiles of atmospheric properties for any orbital or re-entry trajectory can thus be estimated. In addition, this publication contains information on diurnal variations in density up to 90 kilometers, refined analytic expressions which can be used to represent pressure and density profiles of the 1962 Standard and these Supplementary Atmospheres to 80 kilometers, and a mid-latitude ozone model up to 50 kilometers. Tables providing the altitude variation of equal geopotential surfaces as a function of latitude are also included to facilitate application of the atmospheric tables to all locations. For those interested in aircraft pressure altimetry, a set of detailed pressure-altitude tables for levels from the surface up to 10 millibars is included.

The general background leading to development of these tables is contained in the foreword. Technical background is presented in Part 1—Basis of the Tables. Parts 2 and 3 provide detailed insight on the development of the two major sets of tables and include presentations of pertinent supporting data. Part 4 contains the additional material on analytic approximations, ozone, and latitude-altitude relations and Parts 5 and 6 are the major tables of the atmosphere. Throughout the document, figures and tables have been introduced to permit visual comparisons of the varying conditions presented. Major tables are presented in both English and metric systems below 120 kilometers. Above 120 kilometers only metric tables are provided.

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Symbols and Abbreviations

A	area, also empirical parameter
A'	coefficient
Å	Angstrom
a	coefficient in Chebyshev expansion
a_p	geomagnetic planetary index
B	empirical parameter
BTU	British thermal unit
b	subscript indicating base or reference level
°C	degrees, in thermodynamic Celsius scale
C_D	aerodynamic drag coefficient
C_k	Chebyshev polynomial
C_s	speed of sound
c	cycles
cal	calorie
cm	centimeter
CST	Central Standard Time
D	empirical parameter
d	days since January 1
e	vapor pressure
EST	Eastern Standard Time
F	function
°F	degrees, in thermodynamic Fahrenheit scale
$F_{10.7}$	10.7 cm solar flux
$\overline{F}_{10.7}$	10.7 cm solar flux averaged over three solar rotations
f	function
$f(d)$	empirical parameter
ft	foot
G	Newton's universal gravitational constant
GMT	Greenwich Mean Time
g	acceleration due to gravity
g	gram (mass)
H	geopotential altitude
H_b	geopotential altitude of base of layer
H^*	hour angle of sun
H_i	scale height of individual atmospheric constituent
H_p	pressure scale height
h	$H-H_b$
in	inch
j	index
°K	degrees, in thermodynamic Kelvin scale
K_p	geomagnetic planetary index
k	thermal conductivity; also Boltzmann constant
kg	kilogram (mass)
kg-cal	kilogram-calorie
km	kilometer
L'_M	gradient of molecular-scale temperature with geopotential altitude
lb	pound (mass)
LST	Local Standard Time
M	mean molecular weight of air
M_0	sea-level value of mean molecular weight
matm-cm	milli-atmosphere-centimeter

m	meter; also exponent
m′	geopotential meter
mm	millimeter
m_i	molecular (or atomic) mass of individual atmospheric constituent
mb	millibar
MST	Mountain Standard Time
n	number density; exponent and index
o	subscript indicating sea-level value
P	pressure
p	a constant
q	an exponent
°R	degrees, in thermodynamic Rankine scale
R	a constant in the diurnal bulge equation
R^*	universal gas constant
r	effective earth radius; also a density or pressure ratio
s	an exponent associated with temperature profiles in thermosphere
S	Sutherland's constant
SD	standard deviation
STP	standard temperature and pressure
sec	second
T	temperature in absolute thermodynamic scale
T_D	daytime maximum exospheric temperature at particular latitude
T_k	Chebyshev polynomial
T_M	molecular-scale temperature in absolute thermodynamic scale
T_{Mv}	molecular-scale virtual temperature in absolute thermodynamic scale
T_N	nighttime minimum exospheric temperature at particular latitude
$\bar{T}_0$	nighttime global minimum temperature averaged over three solar rotations
T_0	nighttime global minimum exospheric temperature
T_0'	$\bar{T}_0$ corrected for day-to-day variation in solar flux
T_v	virtual temperature in absolute thermodynamic scale
T_x	daytime global maximum exospheric temperature
T_π	temperature at satellite perigee
T_∞	exospheric temperature
u	east-west wind component
UV	ultraviolet
w	watt
x	independent variable
Y	horizontal north-south distance
Z	geometric altitude
Z_m	matching geometric altitude
Z_x	empirical function
α	thermal-diffusion factor
α_π	right ascension of satellite perigee
$\alpha_\odot$	right ascension of sun
β	a constant
γ	ratio of specific heats; also a constant
δ_π	declination of satellite perigee
$\delta_\odot$	declination of sun
η	empirical parameter
θ	empirical parameter
μ	coefficient of viscosity
ξ	argument of Chebyshev polynomial
ρ	mass density
ρ_f	mass density for spring/fall atmospheric models
ρ_s	mass density for summer atmospheric models
ρ_w	mass density for winter atmospheric models
ρ_π	mass density at satellite perigee
ρ_r	mass density at reference altitude
τ	empirical parameter

Φ	geopotential
ϕ	geographic latitude
ϕ_N	geographic latitude of center of diurnal bulge
ψ	empirical parameter
ω	angular velocity of earth

Foreword

The *U.S. Standard Atmosphere, 1962* was developed to serve the aerospace community as a mean basis for design and operation of vehicles and for general scientific considerations. However, there are also requirements for realistic tables of the atmosphere for use in investigations of effects due to nonstandard atmospheric conditions, especially for systematic departures due to geography, season, time of day, and solar activity. The ***U.S. Standard Atmosphere Supplements, 1966*** provide tabulations of atmospheric parameters from the surface to 1,000 km, based upon latitude and season for lower altitudes and as a function of solar activity and angle for higher altitudes. Such tables, designated as supplementary atmospheres, must be judged, found acceptable, and published by a knowledgeable, responsible group such as the U.S. Committee on Extension to the Standard Atmosphere (COESA) in order to receive widest circulation and be utilized with confidence.

COESA is a group of organizations that banded together in 1953 to take actions required to provide the then newborn missile industry with a realistic description of the atmosphere extending beyond altitudes of conventional aircraft operations. Sponsors of this effort are the Environmental Science Services Administration (ESSA), the National Aeronautics and Space Administration (NASA), and the United States Air Force (USAF).* Today, 30 participating organizations, representing government, industry, research institutions, and universities, support this effort. These organizations and the scientists and engineers that have participated at the COESA Working Group level are listed here:

Aerospace Corporation
- R. W. Bruce

Air Force Cambridge Research Laboratories, OAR, USAF
- K. S. W. Champion
- A. E. Cole
- A. J. Kantor
- N. Sissenwine, Executive Secretary of Working Group

Air Force Systems Command, USAF
- W. A. Finley

Air Weather Service, USAF
- H. S. Appleman
- R. S. Quiroz
- D. A. Krider

Applied Physics Laboratory, Johns Hopkins University

Army Electronics Command, USA
- W. Barr

Army Missile Command, USA
- O. M. Essenwanger

Battelle Memorial Institute

Ballistics Research Laboratory, USA
- W. W. Berning

Environmental Science Services Administration, Department of Commerce
- S. Teweles
- A. Kochanski
- H. M. Woolf

Federal Aviation Agency

General Dynamics/Convair

GCA Technology Division
- R. A. Minzner

*Task responsibility assigned to the Air Force Cambridge Research Laboratories (AFCRL).

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High Altitude Engineering Laboratory, University of Michigan
L. M. Jones
Langley Research Center, NASA
W. J. O'Sullivan, Jr.
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Lockheed-California Company
A. Court
E. Ashburn
Marshall Space Flight Center, NASA
O. E. Smith
National Bureau of Standards, Department of Commerce
D. P. Johnson
National Center for Atmospheric Research
P. Julian
S. B. Solot
Naval Proving Grounds, USN
Naval Research Laboratory, USN
P. Mange
Navy Weather Research Facility, USN
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Office of Space Science and Applications, NASA
M. Dubin
R. Horowitz
Smithsonian Astrophysical Observatory and Harvard College Observatory
L. Jacchia, Chairman of the Working Group
Space Technology Laboratories, Inc.
The Boeing Company
The RAND Corporation
E. S. Batten
White Sands Missile Range, USA

For several years COESA has been attempting to assemble information permitting the tabulation of vertical profiles of atmospheric properties as functions of latitude, season, and other systematic influences. Such tables are required chiefly for scientific calculations and investigations of the effect on aerospace vehicle design, of atmospheric departures from the accepted baseline, the *U.S. Standard Atmosphere, 1962*. They will also prove useful in long term planning of specific scientific experiments and aerospace vehicle flights in instances of great sensitivity to atmospheric conditions. For locations and seasons characterized by a minimum in variability of the type caused in the lower atmosphere by weather, supplementary tables may be quite satisfactory as predictions of atmospheric conditions to be encountered for a specific operation or experiment. In other instances a supplementary atmosphere may be the best prediction available even though it is suspected that effects due to nonsystematic variability around it are unacceptably large.

However, readers who intend to use these models operationally, as representations of variations in the real atmosphere, are advised to study carefully the material on limitations (Sections 2.4 and 3.6). This may be particularly important for precise applications during and immediately subsequent to geomagnetic storms (both planetary and polar) in the 120- to 200-km region and at all altitudes within the auroral oval. An example of such an application is precise ephemeris prediction for low-altitude satellites in nearly circular polar orbits.

Development of the new Supplementary Atmospheres has been well coordinated with that of CIRA 1965 (COSPAR International Reference Atmosphere, 1965). This has been achieved through participation of some of the major contributors in both preparatory Working Groups and by presentation of COESA models and studies at COSPAR meetings. Both sets of models give latitudinal and seasonal variations up to 80 km. Though these are somewhat similar there are

some important differences, particularly in the high latitude models, where the COESA profiles appear to be in better agreement with recent data. The new Supplementary Atmospheres give latitudinal variations in properties at all altitudes (up to 1,000 km) and seasonal variations up to about 250 km, so that *continuous* atmospheric profiles from the surface can be obtained for any location and time. No seasonal or latitudinal information is provided in CIRA above 80 km.

This document is the result of the efforts of all Working Group members listed previously. The cochairmen would like to take this opportunity to thank each of them for his unselfish contribution. However, for an effort of this type a small, hard core group of dedicated individuals is also required to bring to fruition the ideas of many people. Special recognition which must be given to them is provided in the following paragraphs.

In addition to guiding the Working Group through several major meetings, Dr. Luigi Jacchia, Working Group Chairman, is responsible for extension into the exosphere of what had originally started out to be a report on systematic variations below 90 km. He illustrated the manner in which satellite-determined density data can be classified by profiles which are logically related to solar activity and the time of day. He followed this contribution by developing a methodology for obtaining a family of exponential temperature curves which fitted these density data after application of the barometric equations. It was adopted with some modifications for this report. Finally, Dr. Jacchia is responsible for much of the text and tables describing the atmosphere above 120 km. These tables also include his findings on the geometry of upper-atmosphere parameters as related to the earth's coordinates and the relationship of solar (and geomagnetic) activity and exospheric temperature. Along with Dr. Jacchia, a great deal of credit must be given to his associate, Jack Slowey. His competence in the programming and computing of tables of atmospheric profiles was invaluable in the tedious process of joining together the families of lower altitude and higher altitude atmospheres.

During the several years of development of these tables, Dr. K. S. W. Champion was a source of strength and knowledge. As a responsible Task Group Convener, he refused to compromise toward a less exact but more convenient solution in joining the lower-altitude seasonally and latitudinally dependent atmospheres to the high-altitude atmospheres. With the aid of his associate, Frank Marcos, he performed extensive studies of the available data in order to present an interface family of curves above 90 km which gradually merge the seasonal and latitudinal variations below this altitude to the upper-altitude atmospheres. Thus the variability shown in the 100- to 250-km altitude interval is most likely to be fairly representative (excluding conditions during geomagnetic storms) of the true but insufficiently explored conditions in this region. Dr. Champion contributed extensively to the development of text and tables for altitudes above 90 km, especially those between 90 and 250 km. He was responsible for convening several Task Group meetings when the situation seemed rather dark during attempts to join the lower- and higher-altitude atmospheres. Through these discussions and presentations of data, Dr. Champion was able to provide the guidance required to overcome the grave difficulty encountered.

Allen E. Cole and Arthur J. Kantor deserve much gratitude for their major responsibility in development of the supplementary atmospheres up to 90 km and for their patience and continuing efforts during the several years required to modify and attach the upper portion of their already well used *Air Force Interim Supplementary Atmospheres* to the high-altitude atmospheres. Mr. Cole led a Task Group of several Working Group members for a number of years in these efforts and showed great skill in assimilating many of their modifications in the original presentations, including those of Dr. Arnold Court, Frederick G. Finger (ESSA), Stanley Batten, Dr. William Nordberg, and Roderick S. Quiroz. Mr. Quiroz also deserves recognition for preparing a section of this report describing diurnal variability of density up to 90 km. Special appreciation must be extended at this time to Paul F. Nee and Eugene A. Bertoni of AFCRL, who assisted in the programming and computation of the tables of surface to 120-km atmospheric properties.

Raymond A. Minzner has been an invaluable contributor in all phases of the development of this volume. He was extremely helpful in resolution of the problem involving the interface altitudes of the 0 to 90 km and the above 200-km atmospheres. He prepared many task level working papers on methodologies of joining the various families of atmospheres. He also prepared a subsidiary table applicable to the family of high-altitude atmospheres, which relates the geometric altitude of geopotential surfaces at all latitudes to that at the standard latitude, 45° N.

COESA's *U.S. Standard Atmosphere, 1962* includes presentations of temperature as approximate analytic functions of altitude, up to 200 km. Although very close fit of the temperature curve was obtained, density and pressure computed from this curve departed considerably from the Standard at certain altitudes. Therefore, it was decided that additional supplementary material

should be developed and included in this volume. Richard A. Hord (with the aid of his associate, Miss Jean P. Mason) and Hermann B. Wobus comprised a Task Group assigned this responsibility. They were able to prepare independent analytic approximations for density and pressure for the 1962 Standard up to 200 km and for the new Supplementary Atmospheres up to 80 km. These should prove invaluable to those concerned with machine programming of interactions of the sensible atmosphere with aerospace vehicles in the mesosphere, stratosphere, and troposphere.

Finally, the COESA Working Group decided there existed a requirement for presenting information on a minor but extremely important atmospheric constituent, ozone. Wayne Hering of the Air Force Cambridge Research Laboratories, though not previously associated with COESA efforts, was called upon and responded with a valuable section on ozone for this volume.

The technical contributions to this volume of course cannot end with the preparation of the draft material. There must be final overseers so that all material may tie together logically and accurately. Responsibility for this fell to the three co-sponsoring organizations. Assigned as technical editors were Dr. K. S. W. Champion, AFCRL; William O'Sullivan, Jr. with the aid of Gerald Keating, NASA; and Harold M. Woolf, ESSA. Major Donald A. Krider also provided informal aid in this phase of preparation. Their extensive efforts are indeed appreciated. They in turn had to be followed by an editorial group completely responsible for format and final preparation. To John Marple, AFCRL's Publication Chief, and his staff, including Eugene Pepin, cover-picture artist, we owe our thanks for completion and publication of this work.

MAURICE DUBIN, NASA
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SIDNEY TEWELES, ESSA
Cochairmen, U.S. Committee on Extension to the Standard Atmosphere

PART 1

Basis of the Tables

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PART 1

Basis of the Tables

1.0 INTRODUCTION

Part 1 contains the basis of the main tables of atmospheric properties that appear in Parts 5 and 6. The specifications of the model atmospheres that are included are listed (Section 1.2). Also included in Part 1 are background information, definitions, equations, physical constants, and conversion factors used in the computations.

1.1 BACKGROUND

Systematic variation in the troposphere due to season and latitude has been fairly well known for years. In fact, when COESA first started to update the Standard Atmosphere in 1953, rough data were presented which depicted this variability up to 30 km, the middle stratosphere. These data were obtained from a limited number of radiosonde flights. However, the requirement for presenting variability in a format similar to the tables in the Standard Atmosphere had not been established.

The current COESA effort to provide supplementary atmospheres received its impetus a little more than five years ago when expansion of the nation's space program generated requirements for information on the variability of atmospheric structure in the design of second-generation scientific and military aerospace vehicles. At that time, a decision was made to utilize a comparatively large mass of data coming into the inventory from a new sensor, the meteorological rocketsonde. It was thought that such data, in conjunction with the very much improved 30-km radiosonde data, would permit construction of typical January and July atmospheric profiles for 30°, 45°, 60°, and 75° N. latitudes and an annual average for 15° N. The extension of these nine atmospheric profiles to an altitude of 90 km was established as the goal. To attain this goal, data from a handful of specialized rocket experiments for altitudes above those of meteorological rockets were subjected to extrapolation techniques through which the wind field is related to gradients of pressure, temperature, and density.

In July 1963, the COESA Working Group, meeting at Fort Collins, Colorado was able to define a generally acceptable set of seasonally and latitudinally determined atmospheres. Seven of these extended to 90 km. The two 75° latitude atmospheres had to be limited to 30 km altitude because of a lack of data. However, due to the different thermal regimes found at high latitudes in winter, four additional atmospheres were defined to represent the warm and cold stratospheric-mesospheric conditions at 60° (to 90 km) and 75° (to 30 km) in January.

At this point, very little additional effort would have been required to provide a follow-on COESA publication to the *U.S. Standard Atmosphere, 1962* with detailed tabulations of these 13 Supplementary Atmospheres. In fact, the Air Force, in response to urgent requirements, published preliminary tables as *Air Force Interim Supplemental Atmospheres*. However, at the Fort Collins meeting, Working Group Chairman Jacchia presented a summary of recent research indicating that it had become feasible to prepare models for altitudes above 200 km which would portray systematic variability resulting from changes in solar flux and zenith angle. New pressures from the aerospace community, this time from atmosphere-space interface interests, made it desirable to extend our supplementary atmospheres to orbital altitudes.

Unfortunately, there was little information on systematic variability for altitudes from 90 km up to 200 km, above the maximum altitude of most rocket sensors and below the minimum altitude of most satellites. Despite this difficulty the Working Group decided to try to provide a reasonable interpolation across this region for the seven basic surface-to-90 km (15° annual and 30°, 45°, and 60° January and July) atmospheres.

The contemplated interpolation required physical expressions for describing the atmospheric profiles obtained from satellite drag. Although the physical relationship was partially understood, it can still be only roughly specified. The final goal of spanning the 90- to 200-km "ignorosphere" was found difficult to attain in spite of intensive research by COESA students of the upper atmosphere.

To review the situation, the COESA Working Group met again in January 1965 at the University of Miami. It was agreed that an inadequate theory is worse than none when it must fit a great many accurate observations. Density profiles acceptably close to those deduced from satellite data can be computed from a family of empirically derived exponential temperature curves and the barometric equations. Thus temperature is continued as the defining parameter

of the atmosphere, as in the case of the lower altitude seasonally and latitudinally specified supplementary atmospheres. All profiles of atmospheric properties converged below altitudes of satellite data to a single boundary condition of density, temperature, pressure, and molecular weight at 120 km which differed only slightly from corresponding values in the 1962 Standard.

The arrangement of these atmospheric tables in terms of exospheric temperature, rather than solar activity, ensures that the family of tables will not become obsolete as relationships between exospheric temperature and solar activity are refined. In utilizing the tables, one notes that the basic high-altitude atmosphere selected will be that with exospheric temperature on the shaded side of the earth appropriate to prevailing solar activity. Exospheric temperatures for other locations can then be obtained from a functional expression requiring only the angle of the sun. These exospheric temperatures serve as the key in selecting the table of atmospheric properties for the location applicable to a specific solar angle.

The meeting at Miami was adjourned with our goal and procedure supposedly well established. The low-altitude supplementary atmospheres (15° N. annual and 30°, 45°, and 60° N. January and July) terminated at 90 km with seven sets of temperature, pressure, and density data. Though the 90-km temperatures and pressures differed substantially, density profiles of these atmospheres appear to be converging to a single value slightly above 90 km. Since an acceptable family of high-altitude atmospheres had been defined which now extended downward to a single set of boundary conditions at about 120 km, connection with the seven low-altitude atmospheres which reached 90 km appeared to be a simple chore. Some manipulation of the lapse rates between 90 and 120 km would be required since consistency through the barometric equation must be achieved. Also, consideration had to be given to several newly available soundings, some of which had been presented at Miami during Task Group sessions. Therefore, it was decided to permit modification of the seven low-altitude models to levels as low as 80 km, if necessary, to provide greater flexibility.

The implication of this decision to join all models at 120 km is that latitudinal/seasonal variability, so well defined in the lower layers, becomes essentially damped out and negligible above 90 km. This simplifying assumption was not borne out by examination of most recent data. More realistic conditions for winter, at least for middle latitudes, are represented if the 30°, 45°, and 60° N. January densities at 120 km are approximately 50 percent above the Standard. Mid-latitude summer and low-latitude data grouped around a density some 20 percent below standard at 120 km. The 15° annual and 30°, 45°, and 60° N. July atmospheres could be conveniently extended to that point. In so doing, the density-altitude profiles for all atmospheres had to pass through a density ranging from 10 percent to 15 percent above standard just above 90 km, a level recently noted to be isopycnic (near-constant density). The concept of such a singular point has proved to be most useful.

Two new families of temperature curves for the interface region above 120 km were developed to connect with the Jacchia high-altitude atmospheres. One family starts with 120-km winter conditions, each member joining smoothly at an altitude in the 200- to 250-km region with the corresponding curve in the family of high-altitude atmospheres, whereas the other family starts at 120-km summer conditions and in similar fashion joins high-altitude atmospheres. These continue upward to 1000 km.

Another important point arose. The available spring and fall soundings, although sparse, indicated that density at 120 km is probably very close to standard. In these soundings, densities near 90 km are also shown to approach isopycnic conditions. It is apparent that if we were developing a new Standard today, density should be 10 to 15 percent greater than the present Standard just above 90 km. Since density variability approaches a factor of 3 around 70 km and is known to amount to orders of magnitude at several hundred kilometers, such a small discrepancy is not sufficient justification for a revision of the 1962 Standard at this time. However, it does appear reasonable to provide additional realism in a report on supplementary atmospheres by including "spring/fall" atmospheres. The Standard appears to be a good representation of spring/fall conditions up to about 70 km, above which a departure is convenient through the 91-km isopycnic to 120 km, meeting exactly the basic family of high-altitude atmospheres suggested by Working Group Chairman Jacchia. With these considerations, a density profile can now be constructed which depicts mid-latitude spring/fall conditions at low altitudes and conditions for the heterosphere for any solar position and degree of solar and geomagnetic activity.

In summary, the goal of these efforts is a description of the complete range of atmospheric properties commensurate with known systematic variations for lower altitudes due to latitude and season, and for the heterosphere due to solar activity and angle. Continuity and internal consistency are maintained between all latitudes and altitudes. Two sets of tables, one for the family of atmospheres below 120 km and the other for 120 to 1000 km, are provided. These families are matched at 120 km.

Further refinements are likely in the future, especially between 100 and 200 km, but it is believed that

the greatest possible correspondence with data and theory currently available is presented by the tables of atmospheric profiles in this new COESA publication.

1.2 ATMOSPHERIC MODELS

1.2.1 MODELS UP TO 120 KILOMETERS.—Systematic (latitudinal and seasonal) variability of properties of the atmosphere is shown for altitudes up to 120 km by a family of internally consistent Supplementary Atmospheres. The following atmospheres are included:

Title	*Latitude*	*Time of Year*
Tropic	15° N.	Annual average up to 120 km.
Subtropic	30° N.	January and July to 80 km; winter and summer 80 to 120 km.
Mid-latitude	45° N.	January and July to 80 km; winter and summer 80 to 120 km. *U.S. Standard Atmosphere, 1962* to 69 km; spring/fall 69 to 120 km.
Subarctic	60° N.	January and July to 80 km; winter and summer 80 to 120 km. Cold and warm stratospheric-mesospheric regimes to 80 km for January.
Arctic	75° N.	January and July to 30 km. Cold and warm stratospheric regimes to 30 km for January.

Some special considerations employed in the development of this lower altitude family of atmospheres are:

a. The distribution of thermodynamic properties in the January and July atmospheres is consistent with the observed wind fields for altitudes up to 80 km.

b. Atmospheric profiles between 80 and 120 km are based on empirical density profiles for the winter, summer, and transitional months. They provide a hydrostatically consistent link between the season- and latitude-dependent atmospheres below 80 km and the families of atmospheres related to diurnal and solar flux variability above 120 km.

c. Atmospheric models are considered applicable to the northern hemisphere only. However, it is believed that they closely approximate conditions as far south as mid-latitudes in the southern hemisphere.

d. A north pole (90° N.) atmosphere is not provided in the low-altitude family of supplementary atmospheres. The 75° N. atmospheres are believed to be the best approximation to the 90° N. atmosphere that can be developed at this time. They are limited to an altitude of 120 km due to the sparsity of rocket observations at this latitude.

e. Models presenting the vertical distribution of thermodynamic properties are defined by temperature-altitude profiles in which the vertical gradients of molecular-scale temperature are linear with geopotential altitude.

f. Molecular weight is assumed to be constant, 28.96 to 80 km, decreasing above 80 km to 26.90 in the spring/fall, 27.12 in the winter, and 26.76 in the summer and 15° N. annual atmospheres at 120 km.

g. Special characteristics of these atmospheres, such as the trade inversion of the tropics and distribution of water vapor in the lower layers, are included.

h. Special attention is given to physical features of a global nature, such as isopycnic levels, which help to tie the family of supplementary atmospheres together.

i. A brief discussion on diurnal variability of atmospheric density for altitudes below 90 km is included in Part 2.

1.2.2 MODELS ABOVE 120 KILOMETERS.—A family of atmospheres between 120 and 1000 km is presented with the following 11 exospheric temperatures: 600°, 700°, 800°, 900°, 1000°, 1100°, 1300°, 1500°, 1700°, 1900°, and 2100° K. Each atmosphere corresponding to a single exospheric temperature divides into separate atmospheres denoting variation with season below the matching altitude, Z_m. These three atmospheres denote typical summer, winter, and spring/fall conditions. The altitude Z_m varies systematically with exospheric temperature within the range 195 to 255 km. For the lower exospheric temperatures the value of Z_m is higher for the winter models than for the summer models, but for exospheric temperatures above 1300° K, Z_m is independent of season.

All the summer atmospheres converge to approximately the same set of conditions at 120 km (density about 20 percent below the Standard), all the winter atmospheres approach another set of conditions (density about 46 percent above the Standard), and all the spring/fall atmospheres converge to a third set of conditions (density 1 percent above the Standard).

1.3 BASIC ASSUMPTIONS AND FORMULAS

1.3.1 PRIMARY CONSTANTS.—The numerical values for the various thermodynamic and physical constants used in the computations of atmospheric properties are the same as those given in Table 1.2.1 of the *U.S. Standard Atmosphere, 1962*, with two exceptions. Surface conditions for each of the atmospheres below 120 km are based on hemispheric mean sea-level values of temperature, pressure, density, and relative humidity for the appropriate latitude and month rather than on standard conditions; and accelerations due to gravity at sea level for latitudes other than 45° N. were obtained from the following expression by Lambert (List, 1963)

$$g_\phi = 9.780356\,(1 + 0.0052885 \sin^2 \phi - 0.0000059 \sin^2 2\phi) \text{ m sec}^{-2}. \quad (1.1)$$

For 45° N. the value of the acceleration due to gravity at sea level (g_0) was taken as 9.80665 m sec^{-2}. This value had been used in most of the earlier standard atmospheres and was adopted for the *U.S. Standard Atmosphere, 1962*. It more precisely applies to a latitude of 45°32′33″. The value at 45° N. from Lambert's formula is 9.80616 m sec^{-2}. The following table shows values of g_0 used in the computations:

TABLE 1.1 ACCELERATION VALUES

Latitude	Values of g_0 (m sec^{-2})
0°	9.78036
15° N.	9.78381
30° N.	9.79324
45° N.	9.80665
60° N.	9.81911
75° N.	9.82860
90° N.	9.83208

1.3.2 PERFECT GAS LAW.—It is assumed that dry air and water vapor-air mixture behave in accordance with the perfect gas law:

$$\rho = \frac{MP}{R^* T_v} \tag{1.2}$$

where M is the mean molecular weight, R^* is the universal gas constant, and T_v is the virtual temperature, obtained from the empirical formula

$$T_v = \frac{T}{1 - 0.379(e/P)}. \tag{1.3}$$

This is the fictitious temperature which dry air must have at the given pressure P, in order to have the same density ρ, as a water vapor-air mixture at the same pressure P, temperature T, and vapor pressure e. The assumption that the mixture behaves as a perfect gas eliminates the necessity for considering minor deviations from the perfect gas law such as the compressibility factor of air which is a function of pressure, temperature, and relative humidity. The error in computed densities resulting from the assumption that air is a perfect gas may approach 0.05 percent below 10 km but becomes less than 0.01 percent above 20 km (List, 1963).

1.3.3 MOLECULAR-SCALE TEMPERATURE.—The molecular-scale temperature T_M is defined by

$$T_M = \frac{M_0}{M} T \tag{1.4}$$

and

$$T_{Mv} = \frac{M_0}{M} T_v \tag{1.5}$$

is the corresponding relation between T_{Mv} and the virtual temperature T_v; M_0 is the mean molecular weight of air at sea level. Due to molecular dissociation and diffusive separation, the mean molecular weight decreases with altitude above 80 km. Hence the value of T_M is larger than the value of T at these altitudes.

1.3.4 HYDROSTATIC EQUATION.—The air is assumed to be in hydrostatic equilibrium and to satisfy the differential equation

$$dP = -\rho g dZ \tag{1.6}$$

where Z denotes geometric altitude.

1.3.5 GEOPOTENTIAL.—The relationship between geopotential altitude and geometric altitude developed in the *U.S. Standard Atmosphere, 1962* is used at 45° N. For latitudes other than 45° N., the following expressions were used to obtain the relationship between geopotential altitude and geometric altitude. The geopotential at a point whose geometric altitude is Z is given by

$$\Phi = \int_0^Z g dZ \tag{1.7}$$

where the integration is performed along the line of force which passes through the point.

The geopotential altitude is given by

$$H = \frac{1}{G} \int_0^Z g dZ \tag{1.8}$$

and is in geopotential meters (m′) when the unit geopotential G is set equal to 9.80665 m^2 sec^{-2}(m′)$^{-1}$.

The inverse-square law of gravitation provides an expression of g as a function of altitude with sufficient accuracy for most model atmosphere computations:

$$g = \frac{g_0 r^2}{(r+Z)^2} \tag{1.9}$$

where r is an effective earth's radius at a specific latitude as given by Lambert's equations (List, 1963). Integration of Eq. (1.8) after substitution of Eq. (1.9) for g, yields

$$H = \frac{g_0}{G}\left(\frac{rZ}{r+Z}\right) \tag{1.10}$$

or

$$Z = \frac{rH}{\left(\frac{g_0 r}{G}\right) - H}. \tag{1.11}$$

Differences between geopotential altitudes obtained from Eq. (1.10) and those computed from the more complex relationship used in developing the *U.S.*

Standard Atmosphere, 1962 are small. For example, values from Eq. (1.10) for 45° N. are approximately 0.2, 0.4, and 33.3 meters greater at 90, 120, and 700 km, respectively, than those obtained from the relationship used in the Standard.

1.3.6 PRESSURE.—Initial pressures (sea-level values for each atmosphere) were obtained from monthly normal sea-level charts for the northern hemisphere (United States Weather Bureau, 1952) based upon a 40-year period of record and from 5-day normal sea-level charts (Lahey et al., 1958) based upon a 20-year period of record. Vertical pressure distributions for altitudes up to 120 km were calculated using the following equations with the appropriate temperature-altitude profiles in which T_M is a linear function of geopotential altitude

$$\frac{P}{P_b}=\left(\frac{T_{Mb}}{T_{Mb}+L'_M h}\right)^{\frac{g_o M_o}{R^* L'_M}} \qquad (L'_M \neq 0) \quad (1.12)$$

and

$$\frac{P}{P_b}=\exp\left(-\frac{g_o M_o h}{R^* T_{Mb}}\right) \qquad (L'_M = 0) \quad (1.13)$$

where $h=H-H_b$.

The quantity H_b is the geopotential altitude at the base of a particular layer characterized by a specific value of L'_M, the gradient of the molecular-scale temperature with geopotential altitude. T_{Mb} and P_b are the respective values of T_M and P at the altitude H_b. It should be noted that T_{Mc} was substituted for T_M at levels below 10 km.

1.3.7 MODELS ABOVE 120 KILOMETERS.—The additional equations and specific techniques used to calculate the models above 120 km are described in Part 3, Section 3.1.

1.3.8 THERMAL WIND EQUATION.—The thermal wind equation is

$$\Delta u=\frac{gh}{2\omega \bar{T} \sin\phi}\frac{\partial T}{\partial Y} \qquad (1.14)$$

where Δu is the change in east-west wind component through the vertical layer $h=H-H_b$, $\bar{T}$ is the mean temperature of the layer, ω is angular velocity of earth, ϕ is latitude, and $\partial T/\partial Y$ the north-south temperature gradient.

1.4 DERIVED QUANTITIES

1.4.1 SPEED OF SOUND.—The expression adopted for the computation of the speed of sound is the same as that used in the *U.S. Standard Atmosphere, 1962*.

$$C_s=\left(\gamma\frac{R^*}{M_o}T_M\right)^{1/2} \qquad (1.15)$$

where γ is the ratio of specific heat of air at constant pressure to that at constant volume and is taken to be 1.40 (dimensionless). Owing to the limitations of Eq. (1.15) at low pressures and high altitudes, tabulations of values for the speed of sound are terminated at 90 km.

1.4.2 COEFFICIENT OF VISCOSITY.—The coefficient of viscosity is defined as a coefficient of internal friction developed where gas regions move adjacent to each other at different velocities. The expression used to compute coefficients of viscosity in the *U.S. Standard Atmosphere, 1962* was used for computation of the tables:

$$\mu=\frac{\beta T^{3/2}}{T+S} \qquad (1.16)$$

where β is a constant equal to 1.458×10^{-6} kg sec^{-1} m^{-1}(°K)$^{-1/2}$ and S is Sutherland's constant, equal to 110.4° K. Equation (1.16) fails for conditions of very high and very low temperatures and under conditions occurring at great altitudes. Consequently, tabular entries for the coefficient of viscosity have been terminated at 90 km.

1.4.3 COEFFICIENT OF THERMAL CONDUCTIVITY.—The same empirical expression as that adopted for the 1962 Standard was used to obtain the tabular values of the coefficient of thermal conductivity:

$$k=\frac{6.325\times10^{-7}T^{3/2}}{T+245.4\times10^{-(12/T)}} \qquad (1.17)$$

Tabular values of thermal conductivity are terminated at 90 km owing to the limitations of Eq. (1.17) at higher levels.

It should be noted that in computing the derived quantities at altitudes below 10 km, T_c was substituted for T and T_{Mc} for T_M.

PART 2

Atmospheric Models Up to 120 Kilometers

PART 2

Atmospheric Models Up to 120 Kilometers

2.0 INTRODUCTION

The defining parameter of the Supplementary Atmospheres below 120 km is molecular-scale temperature presented by linear gradients in geopotential altitude. Relative humidity has been specified at levels up to and including 10 km in the mean annual 15° N. and all January and July atmospheres. The mid-latitude spring/fall atmosphere is the same as the 1962 Standard up to 69 km and consequently is a dry atmosphere.

Vertical pressure and density distributions were calculated from virtual temperature-altitude profiles using the barometric equations from Part 1 and appropriate sea-level pressures. Tables of the virtual temperatures and other properties of the 14 Supplementary Atmospheres, discussed in this section, are given in Part 5.

2.1 CONSTRUCTION OF ATMOSPHERIC MODELS FOR ALTITUDES BELOW 120 KILOMETERS

2.1.1 BELOW 80 KILOMETERS.—Temperature-altitude profiles of the mean January and July atmospheres at 30°, 45°, 60°, and 75° N., and the mean annual atmosphere at 15°N. are based on the temperature-altitude cross section in Figure 2.1. The temperature distribution shown for levels below 30 km was obtained from radiosonde observations. Mean northern hemispheric values were computed at various latitudes from available summaries by giving equal weight to observed and interpolated temperature data at each 10 degrees of longitude. Mean monthly values of relative humidity, Table 2.1, were obtained in a similar manner for levels below 10 km. The initial pressures (sea-level values for each atmosphere) were obtained from monthly

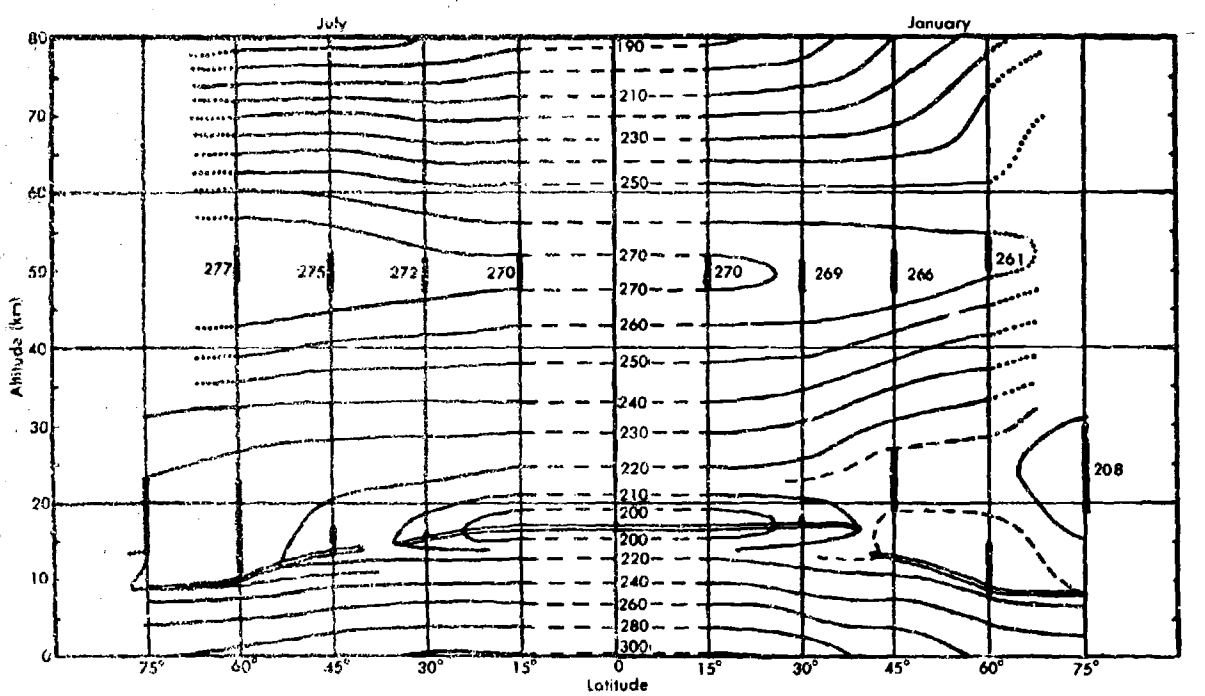

FIGURE 2.1.—Temperature-altitude cross section for January and July.

TABLE 2.1.—VIRTUAL TEMPERATURE STRUCTURE TO 10 KM

15° N. Annual			
Altitude H, m'	Temp T, °K	Virtual Temp T_v, °K	Humidity %
0000	299.65	302.59	75
1000	293.65	295.89	75
2000	287.65	289.34	75
2250	286.15	287.72	75
2500	286.95	287.74	35
4000	276.90	277.36	35
6000	263.50	263.71	35
8000	250.10	250.17	30
10000	236.70	236.72	20

	January 30° N.			July		
Altitude H, m'	Temp T, °K	Virtual Temp T_v, °K	Humidity %	Temp T, °K	Virtual Temp T_v, °K	Humidity %
0000	287.15	288.52	80	301.15	304.58	80
1000	284.15	285.24	70	293.65	295.58	65
2000	281.15	281.86	50	288.15	289.54	60
3000	274.65	275.10	45	282.65	283.72	60
4000	268.15	268.39	35	277.15	277.82	50
6000	255.15	255.24	30	266.15	266.44	40
8000	242.15	242.18	30	252.15	252.27	40
10000	229.15	229.16	30	238.15	238.18	30

	January 45° N.			July		
0000	272.15	272.59	77	294.15	296.22	75
1000	268.65	269.00	70	289.65	291.14	65
2000	265.15	265.43	65	285.15	286.19	55
3000	261.65	261.85	55	279.15	279.78	45
4000	255.65	255.77	50	273.15	273.55	40
6000	243.65	243.70	45	261.15	261.30	30
8000	231.65	231.66	35	248.15	248.21	30
10000	219.65	219.65	30	235.15	235.17	30

	January 60° N.			July		
0000	257.15	257.28	80	287.15	288.45	75
1000	259.15	259.31	70	281.75	282.68	70
2000	255.95	256.09	70	276.35	277.06	70
3000	252.75	252.86	65	270.95	271.45	65
3500	251.15	251.24	60	268.25	.....	.....
4000	247.75	247.82	60	265.55	265.89	60
5000	240.95	.....	.....	260.15	260.38	55
6000	234.15	234.17	50	253.15	253 28	50
8000	220.55	220.55	40	239.15	239.18	40
10000	.....	.....	.....	225.15	225.15	30

TABLE 2.1 (Continued)

Altitude H, m'	Temp T, °K	Virtual Temp T_v, °K	Humidity %	Temp T, °K	Virtual Temp T_v, °K	Humidity %
	January 75° N.			July		
0000	249.15	249.22	80	278.15	278.92	85
1000	252.15	252.23	65	275.55	276.19	75
1500	253.65	253.74	60	274.25	.....	.....
2000	250.90	250.98	60	272.95	273.46	65
2500	248.15	.....	.....	271.65	272.14	65
3000	245.40	245.45	55	268.40	.....	.....
4000	239.90	239.93	50	261.90	262.13	55
6000	228.90	228.91	45	248.90	248.98	45
8000	217.90	217.90	40	235.90	235.92	35
9500	.....	.....	.....	226.15	226.16	30
10000	.....	.....	.....	226.65	226.66	20

normal sea-level charts of the northern hemisphere (USWB 1952) based upon a 40-year period of record and from 5-day normal sea-level charts (Lahey et al., 1958) based on a 20-year period of record. In the development of the temperature field between 30 and 80 km, temperature, density, and pressure observations, taken from December through February and June through August, were considered in arriving at mean monthly values for January and July. The thermal wind equation was employed to obtain estimates of the latitudinal pressure and temperature distributions from available zonal wind observations at various heights above 30 km.

Observed characteristics of the atmosphere such as the level of minimum latitudinal and seasonal temperature variability near 65 km (Nordberg and Smith, 1962), the level of minimum density variability near 90 km (Cole, 1961), and the inverse relationship between mean monthly temperatures at 50 km and those near 70 km (Figures 2.2 and 2.3) were used in arriving at an internally consistent thermal structure for the Supplementary Atmospheres.

A mean annual atmosphere rather than monthly atmospheres was adopted for 15° N. since the monthly variability of the temperature-altitude structure in the tropics appears to be relatively small at levels for which data are available. In addition, the sparsity of observations above 30 km in tropical areas makes it impractical at this time to develop monthly atmospheres between 30 and 80 km. Recent meteorological rocket network observations at Ascension, 8° S., Antigua, 17° N., Grand Turk, 21° N., and San Salvador, 24° N., and falling sphere measurements at Kwajalein, 9° N. (Peterson et al., 1964) leave little doubt that at equatorial latitudes the seasonal variations are minimal.

Typical features of the thermal structure of the tropical atmosphere not evident in Figure 2.1 have been incorporated into the mean annual temperature-altitude profile for 15° N. (Figure 2.3). For example, routine averaging of monthly temperature-altitude data indicates an isothermal layer about 2 km thick from 16 to 18 km. An examination of daily observations, however, reveals a sharp inversion at the tropopause. This sharp inversion, a feature typical of the tropical atmosphere, has been retained and appears at 16.5 km, the mean annual tropopause altitude at 15° N. The average altitude and magnitude of the trade wind inversion, characteristic of the temperature structure between 2 and 3 km over tropical ocean areas, also have been included in the 15° N. temperature-altitude profile. In addition, surface temperature inversions, normally observed during the winter in arctic and subarctic regions, are incorporated into the January temperature-altitude profiles for 60° and 75° N. (Figure 2.2).

Profiles representative of the cold and warm stratospheric regimes observed at 60° and 75° N. in January are shown in Figures 2.4 and 2.5. The frequency of occurrence of warm and cold stratospheric regimes varies with longitude at both 60° and 75° N. Temperature-altitude structures below 30 km for the cold and warm stratospheric regimes at 60° and 75° N. are based on radiosonde observations taken over northeastern Canada during January and the first week of February. Due to insufficient rocket observations at 75° N., temperature-altitude profiles for January and July and the cold and warm winter stratospheric regimes could not be provided for altitudes above 30 km. The two regimes above 30 km at 60° N. are based primarily on rocket observations taken at Fort Churchill (59° N.) during observed cold and warm stratospheric conditions. Most of the available winter grenade observations were taken during days with a cold stratosphere, whereas warm conditions were recorded by a number of thermistor and falling-sphere observations. The num-

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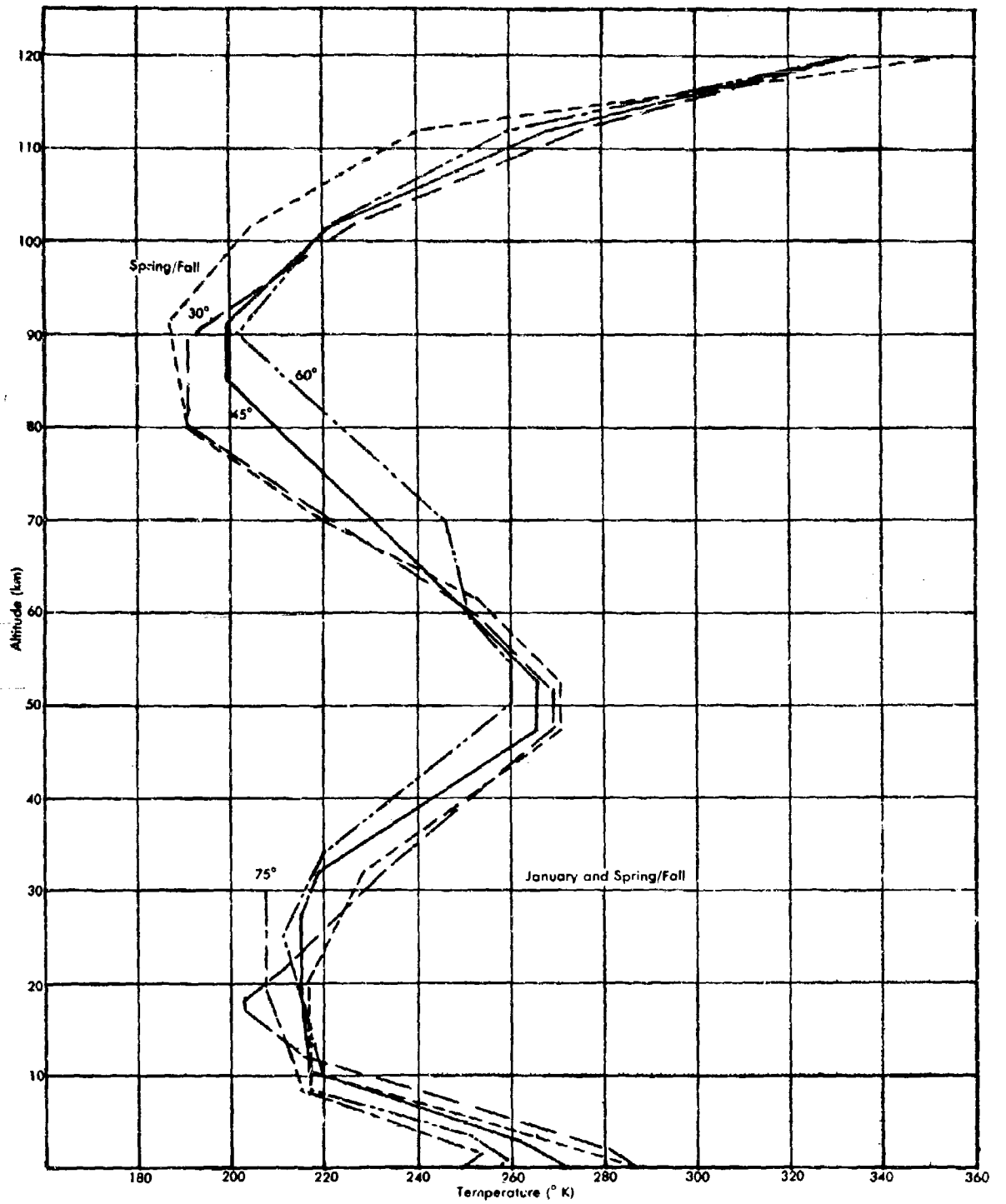

FIGURE 2.2.—Temperature-altitude profiles of the 30°, 45°, 60°, and 75° N. January and mid-latitude spring/fall Supplementary Atmospheres.

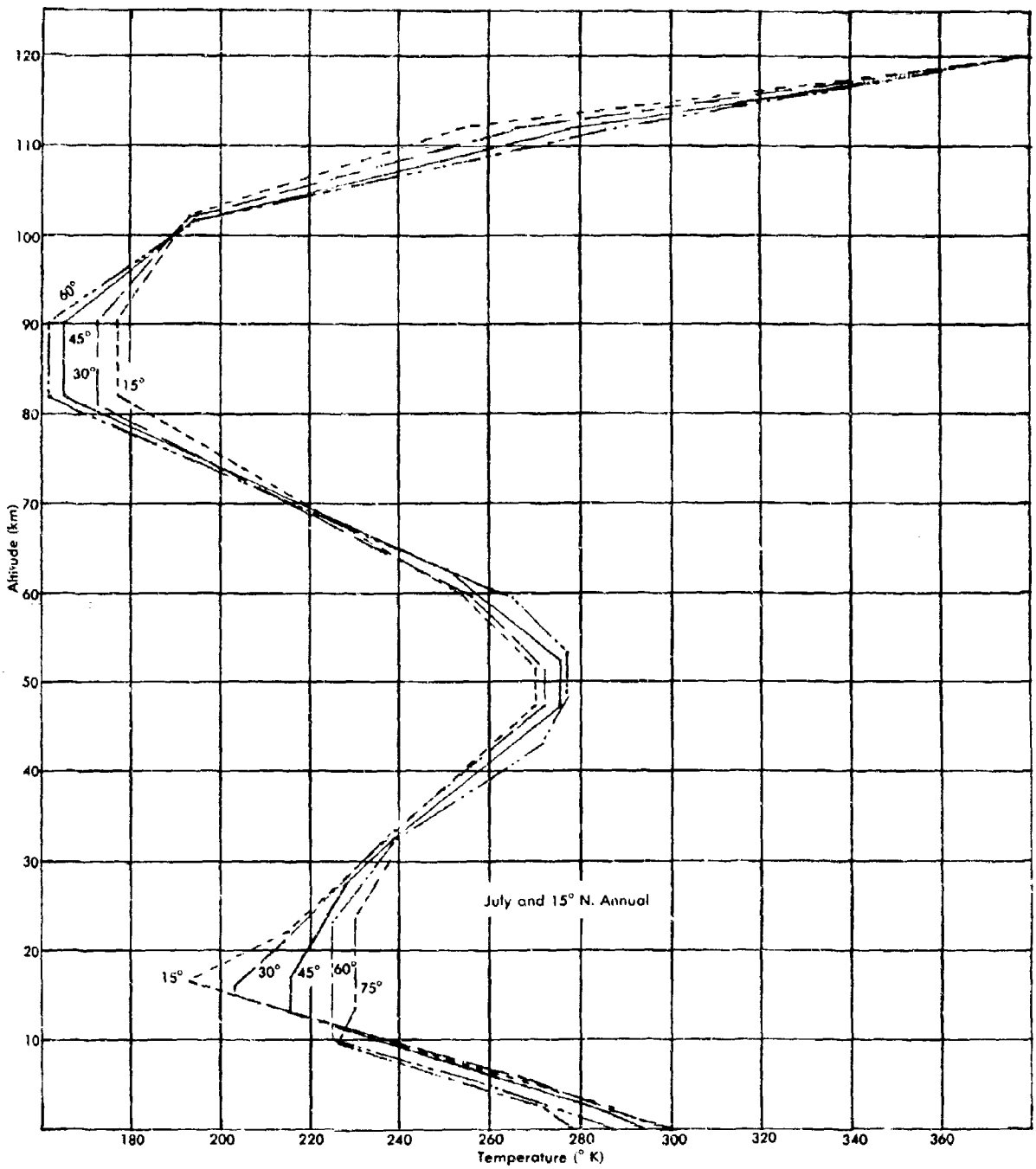

FIGURE 2.3.—Temperature-altitude profiles of the 30°, 45°, 60°, and 75° N. July and 15° N. mean annual Supplementary Atmospheres.

ber of observations above 50 km, however, is inadequate for determining mean temperature-altitude profiles for these cold and warm January regimes. Consequently, the profiles above 50 km are intended only to depict temperatures typical of those obtained from the few rocket observations made during these regimes at Fort Churchill.

The first 69 km of the temperature-altitude profile of the mid-latitude spring/fall atmosphere (Figure 2.2) is the same as that for the *U.S. Standard Atmosphere, 1962*; the portion between 69 and 80 km is based on recent density observations and is intended to approximate mean conditions during the periods of March/April and September/October.

TABLE 2.2.—TEMPERATURE (T_M, °K) STRUCTURE BELOW 120 KM

15° N.	
Altitude H, m′	Annual
0000	299.65
2250	286.15
2500	286.95
16500	193.15
22000	215.15
47000	270.15
51000	270.15
59000	254.15
81000	177.15
89000	177.15
100000	199.15
110000	270.65
117496	410.90

30° N.		
H, m′	January	July
0000	287.15	301.15
1000	.....	293.65
2000	281.15	.....
6000	.....	266.15
12000	216.15	.....
15000	.....	203.15
16000	.....	203.15
17000	203.15	.....
18000	203.15	.....
21000	.....	214.15
22000	213.15	.....
32000	233.15	236.15
47000	269.15	272.15
51000	269.15	272.15
59000	253.15	256.15
79000	191.15	.....
81000	.....	172.55
88000	191.15	.....
89000	.....	172.55
100000	233.15	198.95
110000	290.85	283.25
117612	355.90	410.90

45° N.		
Altitude H, m′	January	July
0000	272.15	294.15
2000	.....	285.15
3000	261.65	.....
6000	.....	261.15
10000	219.65	.....
13000	.....	215.65
17000	.....	215.65
19000	215.15	.....
27000	215.15	227.65
32000	219.15	238.15
47000	265.65	275.65
52000	265.65	275.65
62000	.....	250.65
64000	241.65	.....
81000	.....	165.15
84000	199.65	.....
89000	.....	165.15
90000	199.65	.....
100000	227.65	200.35
110000	282.25	295.25
117776	355.90	410.90

45° N.	
H, m′	Spring/Fall
0000	288.15
11000	216.65
20000	216.65
32000	228.65
47000	270.65
52000	270.65
61000	252.65
69000	220.65
79000	190.65
90000	190.65
100000	210.65
110000	254.25
117776	382.24

TABLE 2.2 (Continued)

60° N.		
Altitude H, m′	January	July
0000	257.15	287.15
1000	259.15	.....
3500	251.15	.....
5000	.....	260.15
8500	217.15	.....
10000	.....	225.15
15000	217.15	.....
23000	.....	225.15
25000	211.15	.....
32000	.....	238.65
34000	220.15	.....
43000	.....	271.65
48000	.....	277.15
50000	260.15	.....
53000	.....	277.15
54000	260.15	.....
59000	251.15	265.15
69000	246.15	.....
81000	.....	161.75
89000	202.15	161.75
100000	226.35	200.25
110000	273.15	303.45
117930	355.90	410.90

60° N.		
H, m′	January Cold	January Warm
0000	257.15	
1000	259.15	
3500	251.15	
8500	217.15	
12000	217.15	224.15
25500	.....	224.15
30000	199.15	.....
35000	206.15	.....
37000	.....	235.65
40000	228.15	.....

60° N.		
H, m′	January Cold	January Warm
50000	256.15	268.15
54000	256.15	268.15
59000	243.15	.....
71000	255.15	225.65
79108	238.93	221.60

75° N.		
H, m′	January	July
0000	249.15	278.15
1500	253.65	.....
2500	.....	271.65
8500	215.15	.....
9500	.....	226.15
11500	213.65	.....
13500	.....	230.15
19000	207.65	.....
23500	.....	230.15
30000	207.65	237.95

75° N.		
H, m′	January Cold	January Warm
0000	249.15	
1500	253.65	
8500	215.15	
11000	.....	222.15
17000	.....	222.15
17500	201.65	.....
25000	197.15	226.15
30000	197.15	233.65

2.1.2 BETWEEN 80 AND 120 KILOMETERS.—The Supplementary Atmospheres outlined in this section have been based on an analysis of experimental data, described in Section 2.4.2, as well as on theory.

Estimates of the mean density deviations from Standard, between 80 and 120 km, are shown as a function of latitude and season in Figure 2.6. These curves, which are based primarily on experimental data, connect at 80 km with the density profiles of the January and July atmospheres for 30°, 45°, and 60° N., the mean annual atmosphere for 15° N., and the mid-latitude spring/fall atmosphere for 45° N. which were discussed in the previous section. The approximate isopycnic level near 90 km should be noted, as well as the large density variation in the altitude region 110 to 120 km.

TABLE 2.3—MOLECULAR WEIGHTS FOR SUPPLEMENTARY ATMOSPHERES

Z, km	Summer	Winter	Spring/Fall
80	28.96	28.96	28.96
85	28.95	28.95	28.95
90	28.94	28.94	28.94
95	28.75	28.79	28.77
100	28.23	28.34	28.28
105	27.78	27.96	27.86
110	27.39	27.63	27.49
115	27.05	27.35	27.17
120	26.76	27.12	26.90

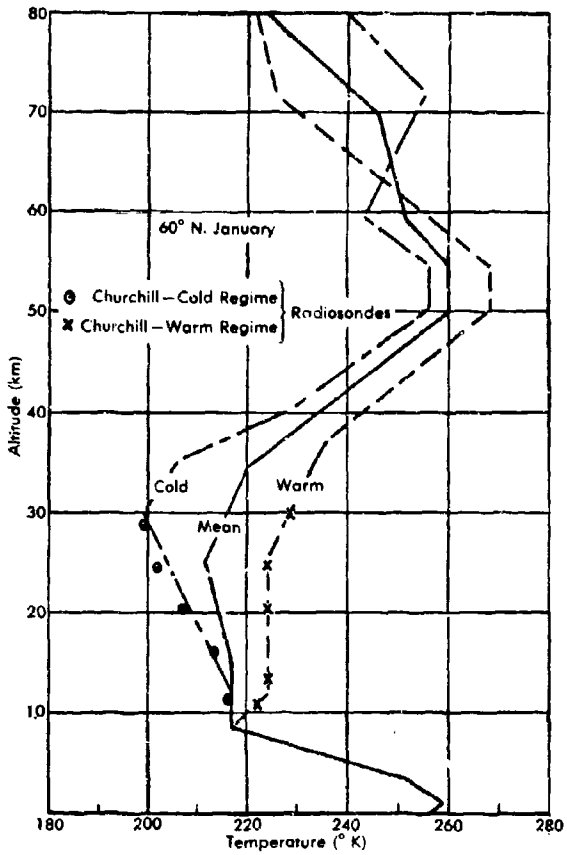

FIGURE 2.4.—Temperature-altitude profiles for 60° N. January mean and cold and warm regime atmospheres.

The density curves in Figure 2.7 are essentially an idealization of those plotted in Figure 2.6. The isopycnic is more pronounced. To reduce the number of boundary conditions at 120 km the curves have been drawn into three points. The first is for spring/fall conditions which match the boundary conditions used by Jacchia (1964) in the development of atmospheric models for levels above 120 km. Density is 1.01 percent higher than the *U.S. Standard Atmosphere, 1962*. The second point is for typical winter conditions with a density about 46 percent greater than Standard and the final point is for summer and tropical conditions with a density 20 percent lower than Standard.

Models for the region 80 to 120 km were developed by choosing suitable temperature-altitude profiles, consisting of straight-line segments of molecular temperature (T_M) in terms of geopotential altitude, which yield density profiles approximately the same as those shown in Figure 2.7.

To obtain values of kinetic temperature (T) from the molecular temperatures it is necessary to have values of mean molecular weight as a function of altitude for levels between 80 and 120 km. Suitable values were derived (Champion, 1966a) and are given in Table 2.3.

2.1.3 DEFINING PROPERTIES.—Adopted molecular scale temperature-altitude structures for each of the 14 atmospheres are shown in Table 2.2. Mean monthly values of relative humidity, ambient temperature, and the resulting virtual temperatures for the lowest 10 km are shown in Table 2.1. Above 10 km the difference between virtual and ambient temperatures is insignificant, since humidity produces a negligible virtual temperature increment at the colder temperatures. It should be noted that the mid-latitude spring/fall atmosphere is the same as the 1962 Standard up to 69 km and is a dry atmosphere.

2.2 LATITUDINAL AND SEASONAL VARIATIONS

Maximum and minimum mean monthly temperature, pressure, and density do not occur at all latitudes between the surface and 120 km in the same month or season. Consequently, the tabulated properties of the January and July Supplementary Atmospheres presented in Part 5 do not represent extreme mean monthly conditions at all altitudes. They do, however, provide an indication of the magnitude of the latitudinal and seasonal variability which can be expected at these levels in the atmosphere.

2.2.1 TEMPERATURE.—Temperature extremes at altitudes below 20 km occur in January and July at most locations between 30° and 75° N. In the stratosphere, however, semiannual and biennial temperature oscillations complicate the annual temperature distribution. The magnitude of the annual cycle is largest at high latitudes, decreasing toward the equator. The amplitudes of the biennial and semiannual cycles are largest near the equator, decreasing toward the poles. The phases, as well as the amplitudes of these temperature oscillations, change with latitude and altitude. A sufficient sample of observations is not available above 30 km from which to establish the vertical extent and magnitude of the biennial oscillation in equatorial regions. North of 15° latitude, however, the annual and semiannual cycles appear to be stronger and tend to obscure the biennial oscillation. Observations show that the semiannual oscillation produces two pronounced maxima and minima within the annual stratospheric temperature cycle in tropical and subtropical regions (Cole et al., 1965). At mid-latitudes the combined semiannual and annual components shift the time of maximum temperature in the stratosphere toward early June or May (Batten, 1963).

Radiosonde data which extend to 30 km indicate that two thermal regimes exist in the winter stratosphere in arctic and subarctic regions (Figures 2.4 and 2.5). In January the cold regime predominates by roughly four-to-one over northeastern Canada (McClain, 1961; Belmont, 1962), whereas the warm regime prevails by nearly eight-to-one in the Aleutian area. Explosive

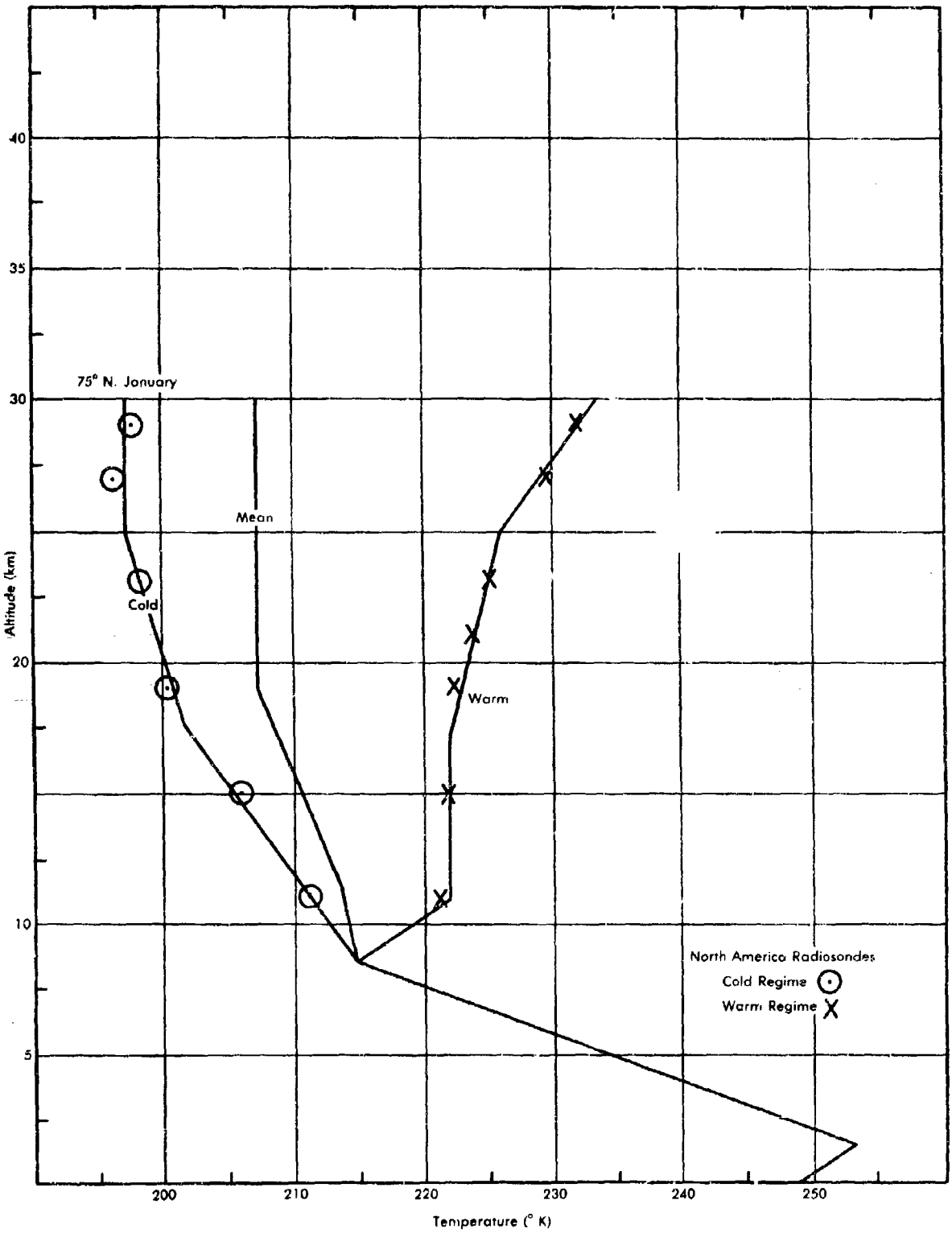

FIGURE 2.5.—Temperature-altitude profiles for 75° N. January mean and cold and warm regime atmospheres.

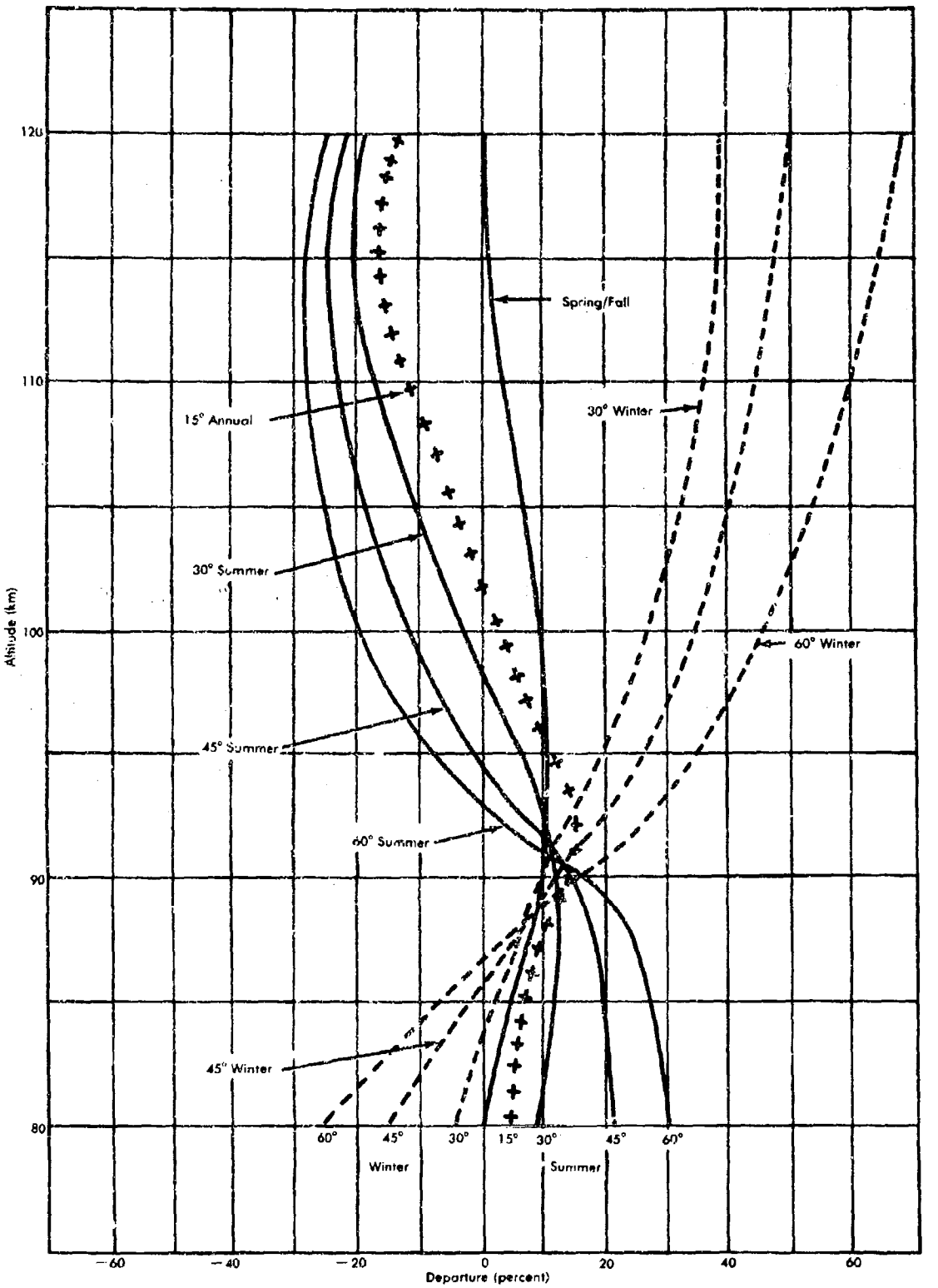

FIGURE 2.6.—Mean density variations with latitude and season, 80 to 120 km.

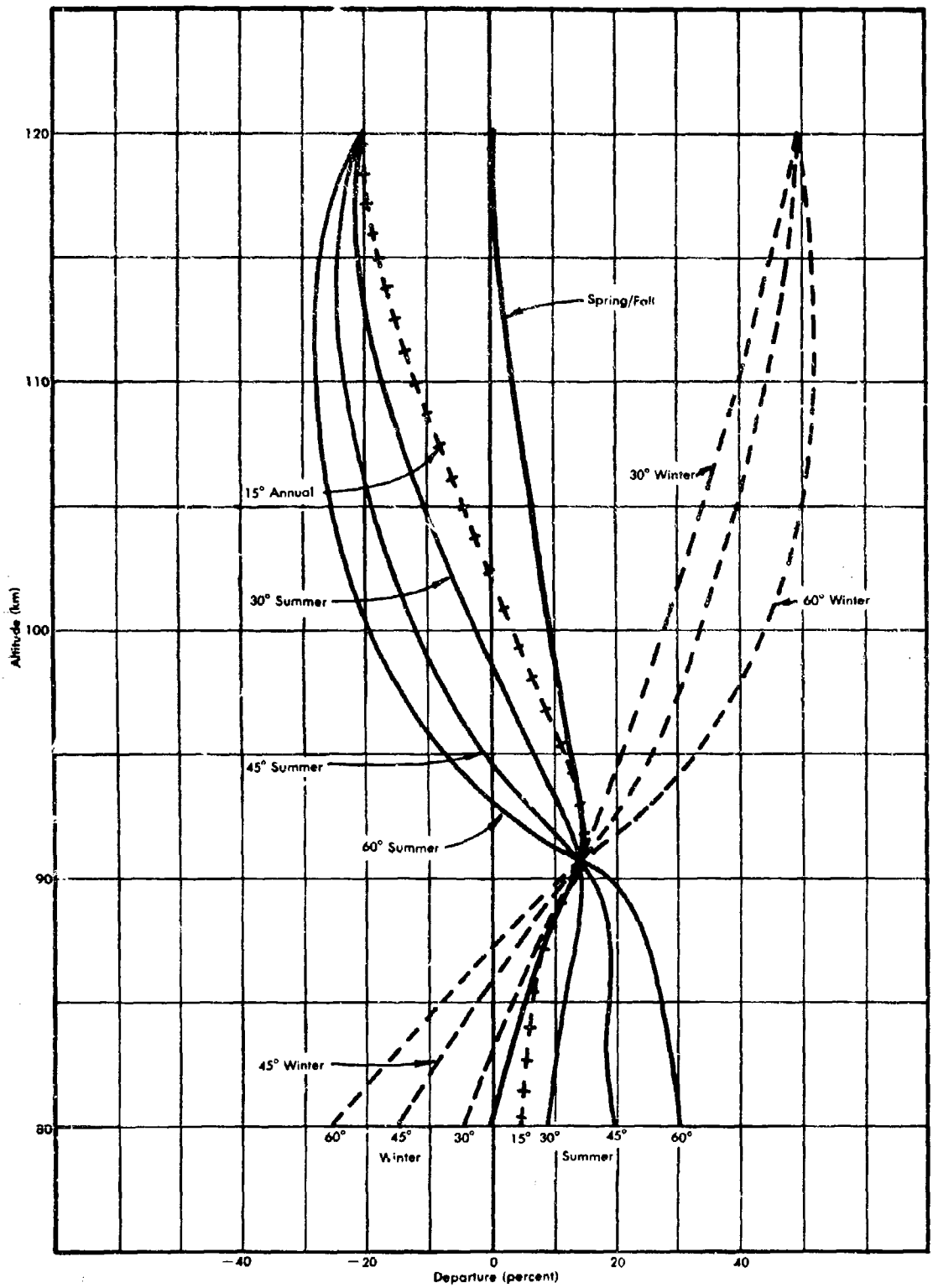

FIGURE 2.7.—Idealized mean seasonal and latitudinal density variations, 80 to 120 km.

warmings, the abrupt change from a cold to an extremely warm regime, occur during the winter in the arctic and subarctic stratosphere and mesosphere and can produce large departures in a given season or month from annual temperature cycles based on long-term averages. The frequency of such occurrences depends on longitude as well as on latitude. Recent meteorological rocket observations between 30 and 50 km indicate that these explosive warmings occasionally affect the stratospheric circulation as far south as Wallops Island, 38° N.

The meridional temperature gradient (Figure 2.1) varies with altitude and season. In the troposphere, from the surface to roughly 10 km, temperatures decrease toward the pole in both seasons. The north-south gradient, however, is much larger during January than July. In July there is a reversal of the meridional temperature gradients between 10 and 15 km; temperatures above these levels increase toward the pole rather than the equator. The thermal structure in this region is not as well defined in January because of the relatively large variations with latitude in the thickness of isothermal and near-isothermal regions immediately above the tropopause.

In the upper stratosphere and lower mesosphere, 25 to 60 km, temperatures increase toward the pole in July and toward the equator in January. This is in accord with expected seasonal variations in the solar heating at these altitudes. At the stratopause, the region of maximum temperature near 50 km, the mean monthly temperature at 60° N. is approximately 17° K warmer in July than in January. The corresponding change at 30° N. is 3° K.

The meridional temperature gradients reverse again above 65 km and temperatures increase toward the pole in January and decrease in July in the upper mesosphere and lower thermosphere, 70 to 110 km. Temperatures in this region are inversely related to those in the stratosphere. A warm stratopause, for example, is normally associated with a cold mesopause. Grenade soundings taken in northern Sweden during 1963 and 1964 (Witt et al., 1965) confirm the existence of this inverse relationship between stratopause and mesopause temperatures during the summer months at northern latitudes. Near 80 km temperatures average 50° K warmer in January than July at 60° N. Seasonal differences at this level, however, decrease with latitude to approximately 10° K at 30° N.

The step function in the north-south temperature gradient at 120 km (Figures 2.2 and 2.3) is the result of an arbitrary decision to establish three sets of boundary conditions at this altitude, the interface between seasonally- and latitudinally-defined atmospheres below 120 km and the family of atmospheres related to solar activity above 120 km. The altitude interval between 100 and 180 km is the least explored region of the atmosphere. Operational meteorological rockets do not reach above 70 km, and satellites seldom orbit below 150 km. Consequently, data presented for this region are considered only an approximation of actual conditions.

2.2.2 DENSITY AND PRESSURE.—Density profiles for each of the Supplementary Atmospheres are shown in Figures 2.8 and 2.9 as percentage departure from Standard. The region of minimum seasonal and latitudinal variability in density near 8 km represents the first isopycnic level where density remains relatively constant throughout the year regardless of location. A second isopycnic level appears to exist just above 90 km where density profiles of all latitudes and seasons tend to converge or cross at a density roughly 10 percent greater than Standard (Cole, 1961; Champion, 1965). This concept of a second isopycnic level near 90 km is supported by density observations and observed wind and temperature distributions between 60 and 100 km. The levels of maximum seasonal and latitudinal variability in atmospheric density occur between 65 and 75 km and 100 to 120 km. Seasonal variability is greatest at high latitudes. To reduce the number of boundary conditions at 120 km the density profiles (Figures 2.6 and 2.7) have been arbitrarily drawn into three points. The limitations discussed in the previous section on temperature also apply to density between 100 and 120 km.

Density profiles associated with typical warm and cold stratospheric and mesospheric thermal regimes observed at 60° and 75° N. in January are shown in Figures 2.8 and 2.9, also in terms of percentage departures from Standard. The profiles for 60° N. in Figure 2.8 indicate that during January at 70 km, the warm regime density is approximately 80 percent greater than the cold regime density. Although these atmospheres are intended to depict typical January conditions, similar conditions can occur in the arctic and subarctic during other winter months.

The pressure profiles in Figures 2.10 and 2.11 are similar to those for density. A level of minimum seasonal pressure variability exists near 85 km which reflects the negative correlations between temperatures at altitudes above 70 km and below 60 km. The limitations that apply to the density between 100 and 120 km owing to the assumption of only three sets of boundary conditions at 120 km also apply to the pressure at these altitudes.

2.3 DIURNAL VARIATIONS OF DENSITY TO 90 KILOMETERS

One of the more important aspects of the variability of density is the diurnal variation, that is, the variation within a 24-hour period which remains after synoptic-scale effects are eliminated. Since sufficient observational evidence is not yet available to describe definitively the diurnal variation between 30 and 90 km, some speculation is necessary.

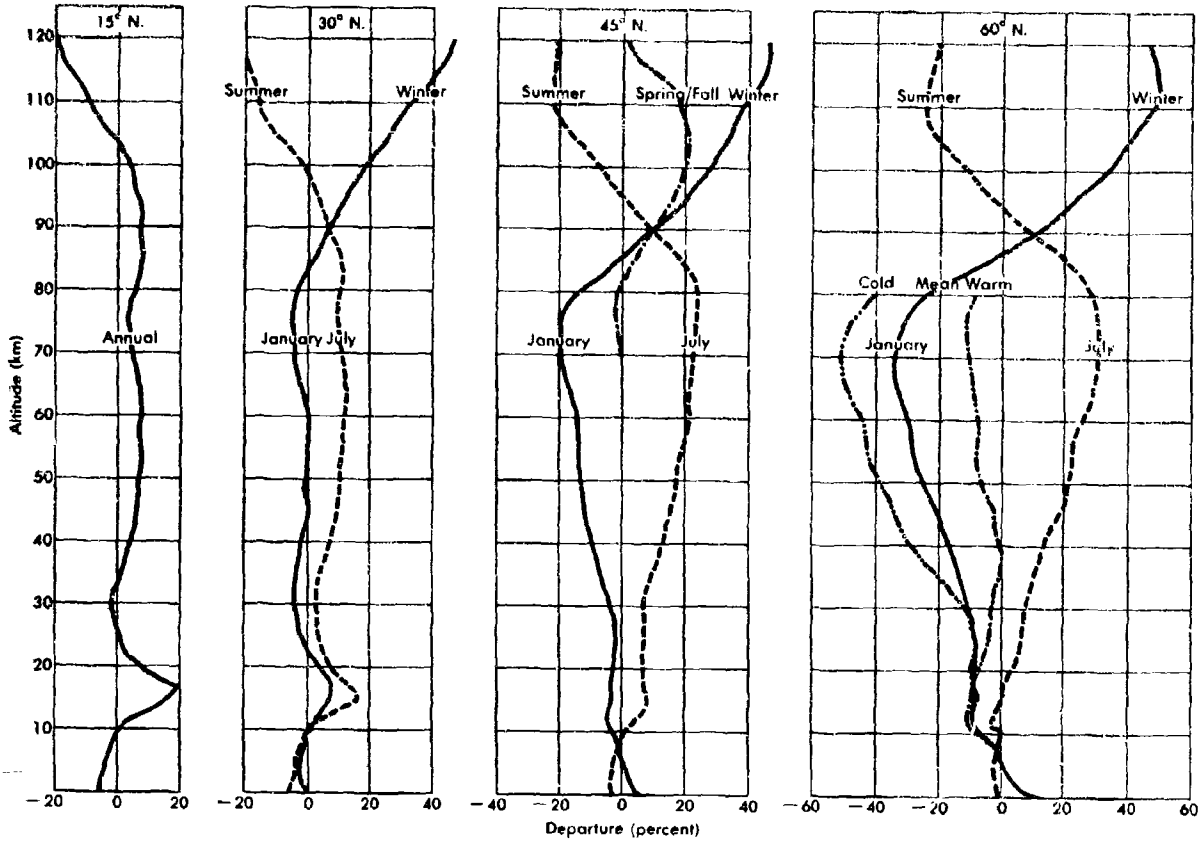

FIGURE 2.8.—Departures of Supplementary Atmosphere densities from Standard.

The diurnal variation of density is attributed, in part, to the rise and fall of the constant density surfaces in association with thermally- and gravitationally-produced oscillations of the atmosphere. From a consideration of the relative radiational and gravitational forces acting on the lower and upper atmosphere, and taking into account the high density of the lower atmosphere, one expects that oscillations of the lower atmosphere should be of relatively small amplitude. Thus, the diurnal variation of density due to atmospheric oscillations at the heights of interest should be correspondingly small.

Near sea level the diurnal range is generally 1 percent to 6 percent of the minimum density, depending on climatological regime. Maximum density tends to occur near the time of minimum temperature, as a rule, shortly before sunrise.

In the free air to a height of about 30 km, the expected diurnal range varies from less than 1 percent to as much as 2 percent of the minimum density. Maximum density is expected during nighttime below about 10 km, and in daytime above that altitude.

At about 30 to 40 km, the diurnal range is expected to be about 2 to 5 percent. However, suitable observational data are lacking for a final determination. Minimum density is expected during the day in phase with diurnal heating due to the absorption of solar radiation by ozone.

From 45 to 90 km, the structure of diurnal density variability may be complicated by the variable influence of lunar gravitational oscillations of the atmosphere. When the lunar effect is combined with the effect of diurnal atmospheric expansion related to the absorption of heat in the ozonosphere, a complicated diurnal density wave with variable amplitude can be expected. Tentative observational evidence from three series of ROBIN falling-sphere soundings on 10 and 18 May 1961 and 12 October 1962 at Eglin Air Force Base, Florida, suggests a diurnal range of about 10 percent, possibly as high as 25 percent, in the vicinity of 60 km. Maximum density occurred during the afternoon. At about 95 km, results from meteor observations (Hall, 1960) suggest a diurnal density range of 30 percent or more with maximum density during late afternoon. However, the accuracy of density values deduced from meteor observations is rather uncertain.

From the foregoing, it may be estimated that the factor by which the daytime density exceeds the minimum at heights of from 50 to 90 km varies from

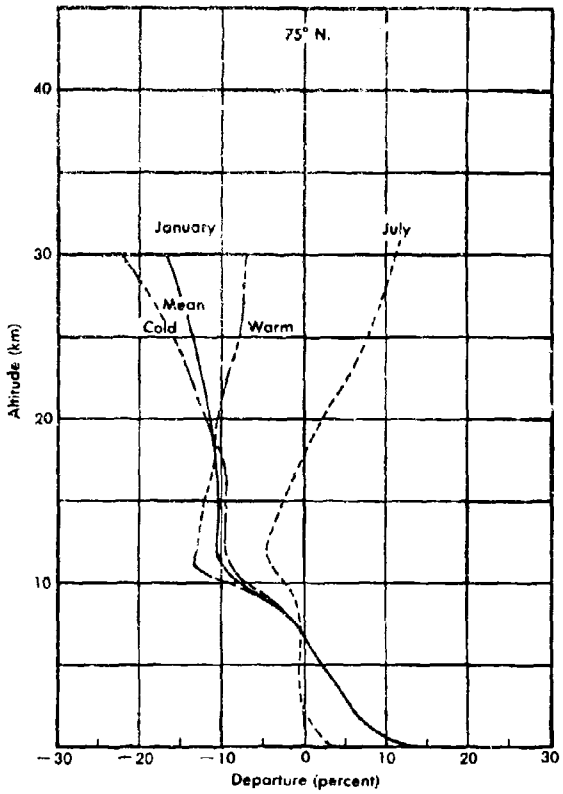

FIGURE 2.9.—Departures of 75° N. Atmosphere densities from Standard.

1.10 to 1.25. However, at times when the lunar tidal oscillation and the thermally induced oscillation are of the same or opposite phase, this factor might take on values greater than 1.25 or less than 1.10, respectively. Estimated ratios of the diurnal maximum and minimum densities for altitudes up to 90 km are presented in Figure 2.12.

The apparent existence of a quasi-isopycnic level near 90 km would seem to suggest that the diurnal variation has a minimum in this region. A minimum at 90 km, however, would be difficult to reconcile with the amplitude deduced at 95 km from meteor results. In view of the uncertainty, an alternate curve has been entered between 70 and 90 km in Figure 2.12. It is emphasized that sustained observational series which might permit a definitive evaluation of the diurnal variations between 30 and 90 km are not yet available. Although Figure 2.12 clearly does not provide final information, it is at least indicative of the various unsolved problems surrounding the diurnal variation.

2.4 SUPPORTING DATA

2.4.1 BELOW 80 KILOMETERS.—Data available for constructing the various atmospheres to 80 km com- p[illegible] adiosonde observations at stations within a few [illegible]es of latitudes 15°, 30°, 45°, 60°, and 75° N. and observations made from rockets and instruments released from rockets. The rockets were fired at the following locations:

Locations	*Latitude*
Kwajalein	9° N.
Eniwetok	11° N.
Guam	13° N.
Kauai	22° N.
Cape Kennedy	28° N.
Eglin AFB	30° N.
Kindley AFB	32° N.
White Sands Missile Range	32° N.
Point Mugu	34° N.
Wallops Island	38° N.
Tonopah Range	38° N.
Michikawa Japan	40° N.
Fort Churchill, Canada	59° N.
Fort Greely, Alaska	64° N.
Point Barrow, Alaska	71° N.
Ascension Island	8° S.
Woomera, Australia	31° S.
Aboard Ship	North Atlantic

Although there has been a recent increase in the number of locations taking meteorological rocket observations, the preponderance of available data is for North America. This is particularly true for levels above 50 km.

Recently compiled distributions of observed data are compared to adopted mean monthly values for January and July in Figures 2.13, 2.14, 2.15, and 2.16. Temperatures obtained from thermistor and grenade observations taken at locations near 30° latitude are plotted with temperature-altitude profiles for the 30° N. atmospheres in Figure 2.13. The mean monthly thermistor temperatures that are shown for Point Mugu, 34° N., White Sands, 32° N., and Cape Kennedy, 28° N., are based on Meteorological Rocket Network (MRN) observations taken during the period 1961 through 1965. Mean seasonal grenade values are based on experimental observations taken at Wallops Island, 38° N. (Nordberg et al., 1965, Smith et al., 1964) and Woomera, 31° S. (Groves, 1965) during the period 1959 through 1964. Thermistor and grenade observations for each location and level, in approximate number, are given in Tables 2.4 and 2.5. Many of the observations were made after the atmospheric models were constructed. Seasonal rather than monthly means are presented for the grenade data because of the sparsity of January and July observations above 55 km.

A similar comparison is made in Figure 2.14 between the temperature-altitude profiles for the mean January

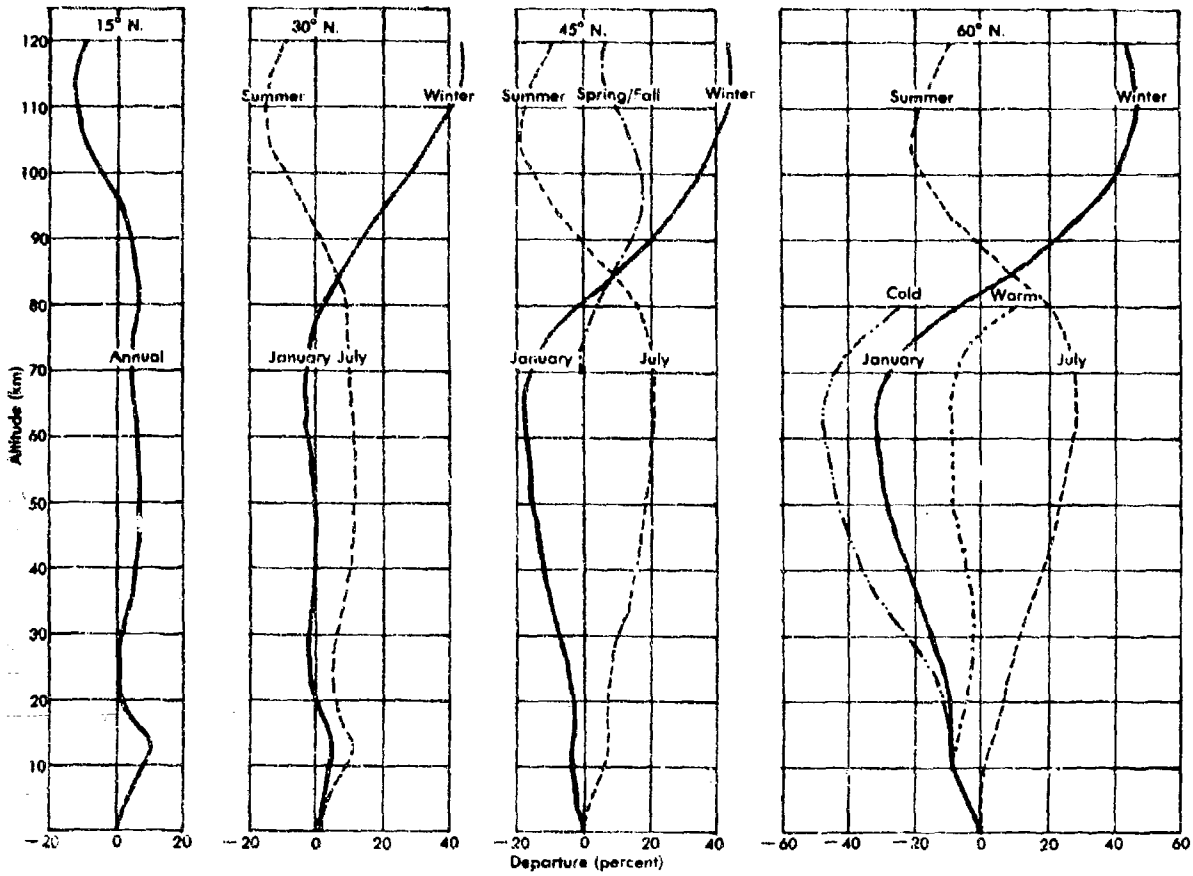

FIGURE 2.10.—Departures of Supplementary Atmosphere pressures from Standard.

TABLE 2.4—NUMBER OF JANUARY AND JULY MRN THERMISTOR OBSERVATIONS

Altitude km	Point Mugu		White Sands		Cape Kennedy		Fort Churchill		Fort Greely		West Geirinish	
	Jan	July	Jan	July	Jan	July	Jan	July	Jan	July	Jan	July
30	17	17	21	30	25	22	8	11	10	2	10	
35	16	17	21	29	24	22	7	11	10	2	10	
40	13	15	22	27	25	22	6	11	10	2	9	
45	12	15	18	26	22	22	6	11	9	2	9	
50	5	14	9	23	19	21	5	10	8	2	8	
55		9	7	21	10	19					8	
60											8	

TABLE 2.5.—NUMBER OF CHEMADE OBSERVATIONS FOR ALTITUDES ABOVE 50 KM

Season	Wallops	Woomera	Fort Churchill
Winter	17	3	13
Summer	10	3	8

and July atmospheres for 60° N. and temperature observations made at Fort Churchill, 59° N., Fort Greely, 64° N., and West Geirinish, 57° N. It should be noted that the Fort Greely January temperatures between 30 and 40 km are considerably warmer than those for Churchill and West Geirinish. Radiosonde data indicate that similar differences exist at 20 to 25 km. Consequently, it appears that these differences

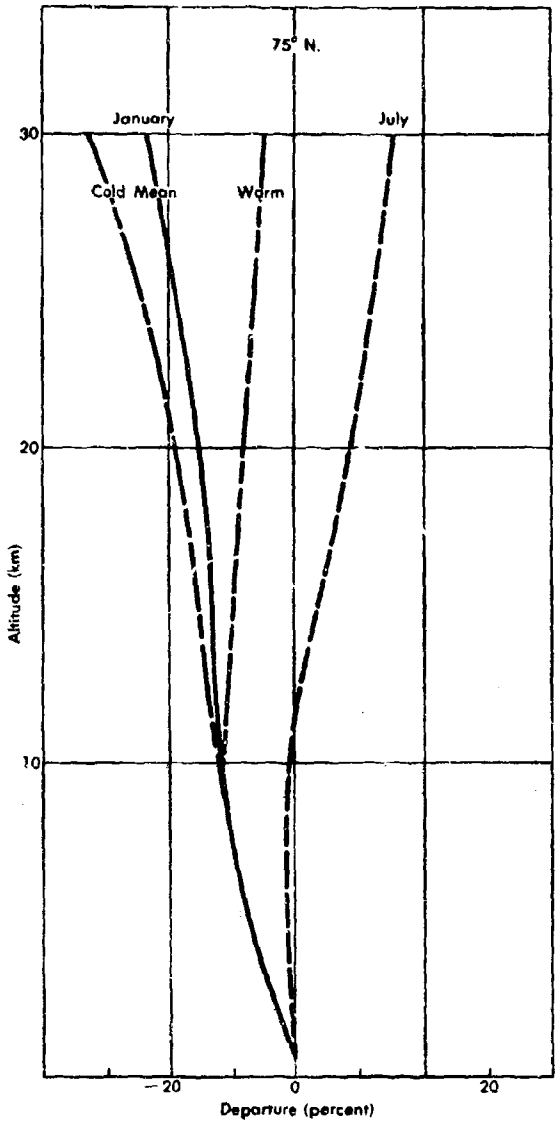

FIGURE 2.11. – Departures of 75° N. Atmosphere preasures from Standard.

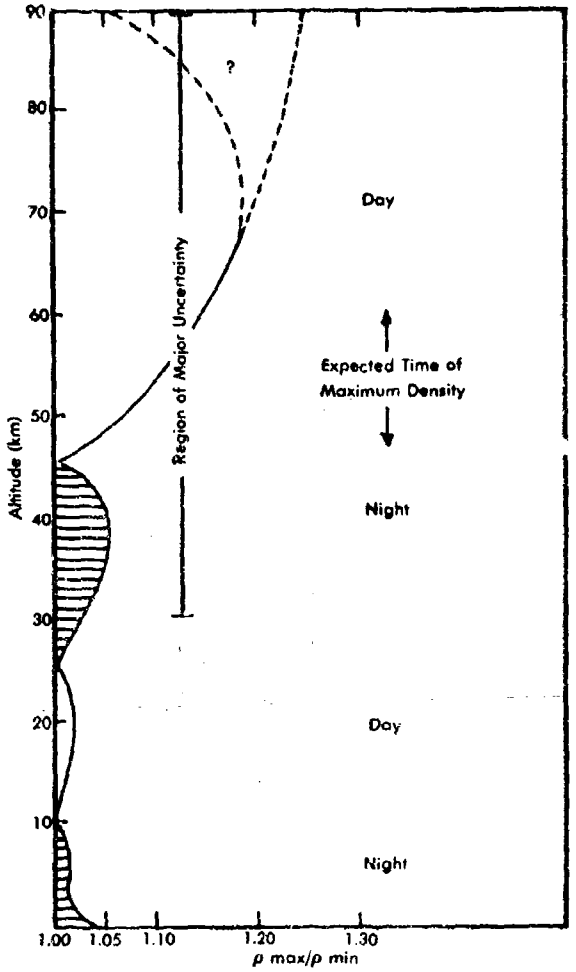

FIGURE 2.12. – Approximate values of diurnal density variability up to 90 km.

are due to longitudinal variations in stratospheric temperatures. The Fort Greely temperatures, however, are in close agreement with those for the 60° N. warm January atmosphere in Figure 2.4.

A summary of MRN and other density data for January and July from locations near 30° N. and 60° N. latitude is provided in Figures 2.15 and 2.16. Density is presented as percentage departure from the *U.S. Standard Atmosphere, 1962*. The horizontal arrows indicate a range in density at various levels which contains approximately 95 percent of the observed values. The data below 50 km are from MRN observations taken in January and July and the estimated 95 percent ranges are based on two standard deviations. The density ranges at altitudes above 50 km are estimates based on departures of grenade, falling sphere, and pressure gage measurements from individual monthly means during the summer and winter seasons. Note that at the higher latitudes the distribution of observed densities around the monthly means is not symmetrical. The January density distributions for 60° N. are based primarily on Fort Churchill data and are undoubtedly influenced by the two thermal regimes which tend to produce bimodal temperature distributions in the arctic and subarctic winter stratosphere and mesosphere. The skewed July distribution is probably a result of the inadequate data sample.

The indicated density variability includes some diurnal and semi-diurnal variations due to solar and lunar effects since the observations on which the estimates are based were not all taken at the same hour of the day. They also include observational errors which comprise part of the observed variability. Re-

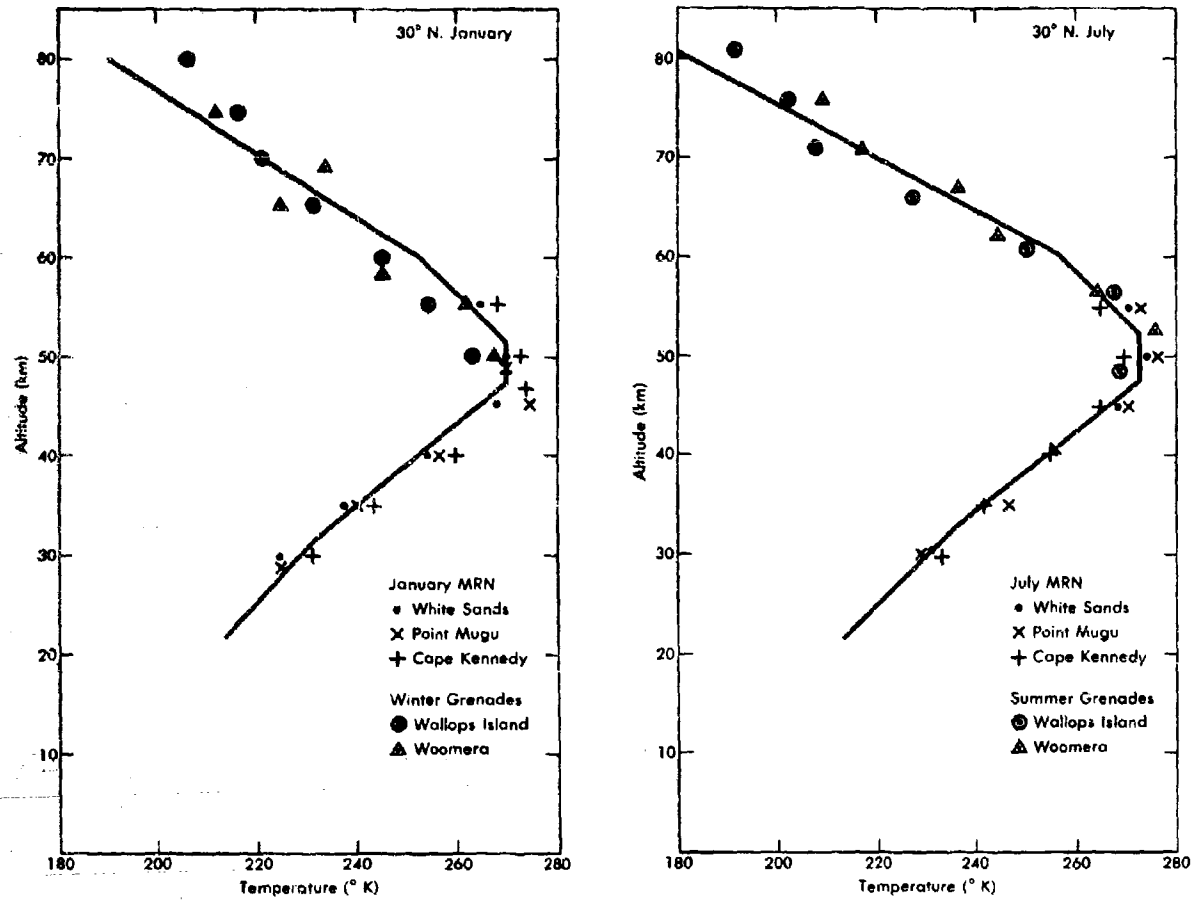

FIGURE 2.13.—Comparison of some observed temperatures with 30° N. temperature-altitude profiles.

cent experimental observations between 80 and 120 km are presented in Section 2.4.2.

Summer and winter pressure profiles based on approximately 61 rocket grenade soundings (Nordberg et al., 1965) are shown as percentage departure from Standard in Figure 2.17. These profiles, which are similar to those shown for the various models in Figure 2.10, indicate that in this altitude range winter pressures are lower and summer pressures generally higher than Standard. The seasonal variation is largest at high latitudes. It should also be noted that the range of seasonal and latitudinal variations is small at 80 km.

The thermal wind relationship was employed to obtain estimates of the temperature distribution with latitude from available zonal wind observations at various altitudes between 30 and 80 km. Geostrophic zonal wind components computed from the latitudinal pressure gradients of the Supplementary Atmospheres are compared with recent zonal wind summaries based on appropriate MRN and grenade observations (Figures 2.18 and 2.19).

Observed zonal winds at Wallops Island, 38° N., and Green River, 39° N. (Figure 2.18), locations approximately halfway between 30° and 45° N., compare favorably with the geostrophic values computed from the 30° and 45° N. atmospheres.

Observations are not available for a point midway between 45° and 60° N. Instead, January and July zonal wind observations at Fort Churchill, Fort Greely, and West Geirinish, locations near 60° N., have been compared in Figure 2.19 with the computed geostrophic winds between 45° and 60° N. The values observed in July at Fort Churchill and Fort Greely are in relatively good agreement with the computed winds. Observed winds for January, however, vary considerably with longitude. Fort Greely at 146° W. has the lightest and West Geirinish at 7° W. the strongest zonal winds, with Churchill values intermediate. An analysis of available data at Fort Churchill indicates that strong westerly winds above 30 km normally are associated with a cold stratosphere. The Churchill winds which were used to determine the temperature gradient in this region were weighted on a four-to-one basis, the ratio of cold to warm stratospheric regimes in January. This provides a January wind distribution which compares favorably with the geostrophic zonal

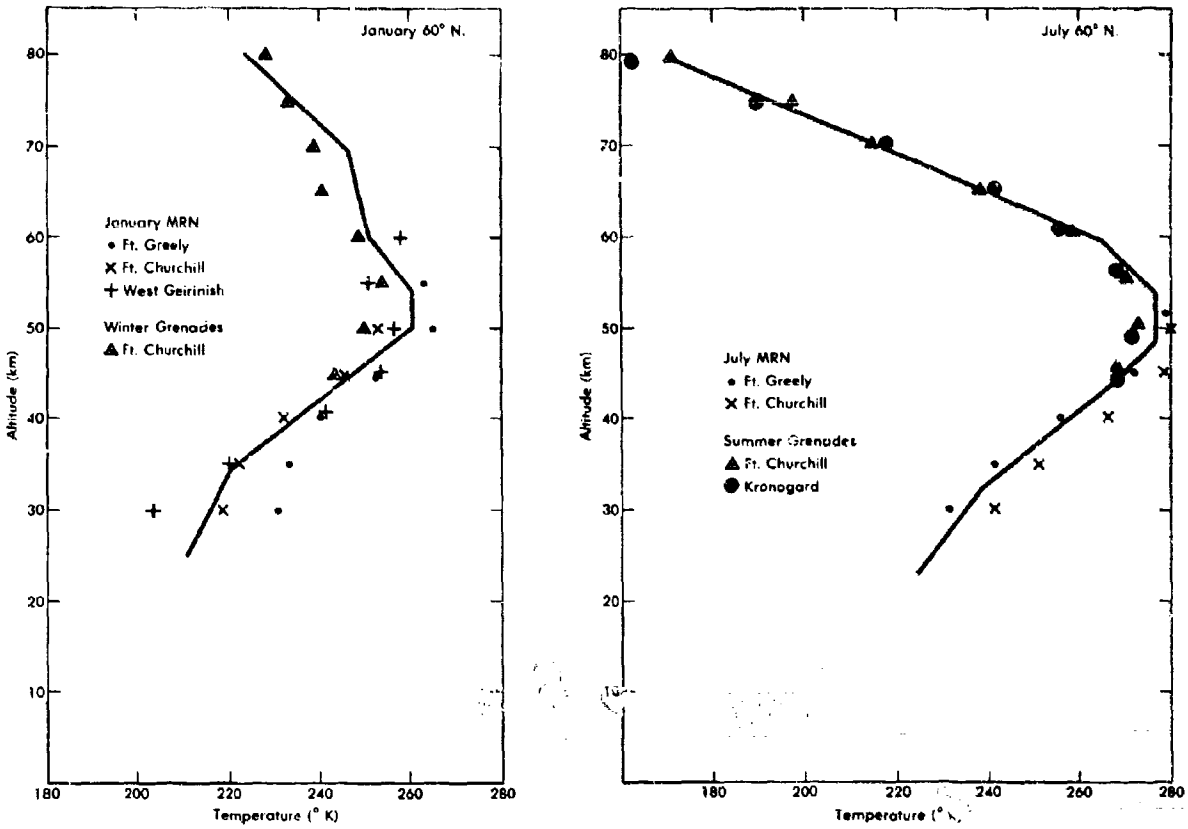

FIGURE 2.14.—Comparison of some observed temperatures with 60° N. temperature-altitude profiles.

winds computed from the pressure distribution between the January 45° and 60° N. atmospheres.

2.4.2 BETWEEN 80 AND 120 KILOMETERS.—Data available for extending the latitudinal and seasonal atmospheres from 80 to 120 km comprise primarily density measurements. Summaries of recent measurements and results of previous analyses of data in this region are presented and discussed in this section.

An analysis of data from 13 falling sphere firings at Kwajalein (Peterson et al., 1965) is contained in Figure 2.20. The plotted curve represents the mean density values given as percentage departure from Standard. On either side of the mean curve are plotted curves indicating the standard deviation (Crowley and Sandlin, 1964) of the individual observations about the observed means. The mean curve is considered the best available estimate of the annual average density for 10° latitude.

Results obtained by Peterson (1964) from two flights of radar tracked one-meter inflatable spheres at Wallops Island in June 1961 and 1962 are shown in Figure 2.21. Figure 2.21 also contains a mean curve and envelope curves which indicate the range of observed densities at 38° N. in June.

Estimates (Kantor and Cole, 1963) of the mean summer and winter density profiles for 45° and 60° N. are plotted as percentage departures from Standard in Figure 2.22. The 45° N. profiles, based on observed wind and thermodynamic properties, are probably accurate up to 110 km but uncertain above that altitude. This applies particularly to the crossing of the curves and reversal above 123 km. The curves for 60° latitude are based on new measurements at Churchill (59° N.). The observed values appear to verify the trend toward greater seasonal fluctuation with increasing latitude. The level of maximum seasonal variability appears to lie between 110 and 120 km at latitudes higher than 30°. Above this level the seasonal variability probably decreases.

Figure 2.23 contains the results of 12 falling sphere density measurements. Six were made at White Sands (Faire and Champion, 1965) and six at Eglin AFB (Faire and Champion, 1966). At levels between 60 and 80 km the measured densities range from 10 percent greater to approximately 16 percent less than Standard. Between 80 and 90 km there is a marked change in the data. The difference between the observed minimum densities and the 1962 Standard decreases until at 90 km the observed minimum values correspond to those of the Standard and the maximum densities are 30 percent greater than Standard. Thus, these data suggest a mean density approxi-

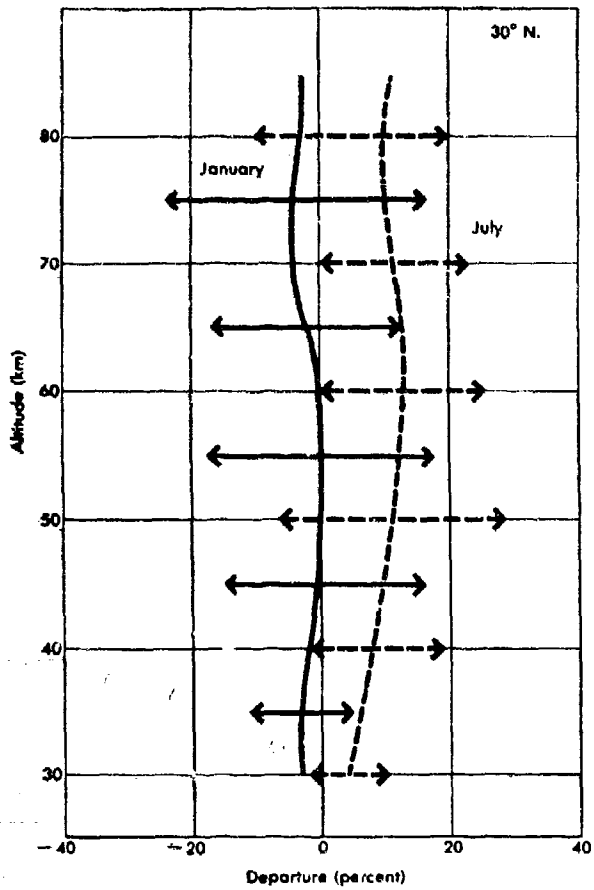

FIGURE 2.15.—Approximate 95 percent range of observed values (indicated by arrows) around the density-altitude profiles for the January and July 30° N. Supplementary Atmospheres.

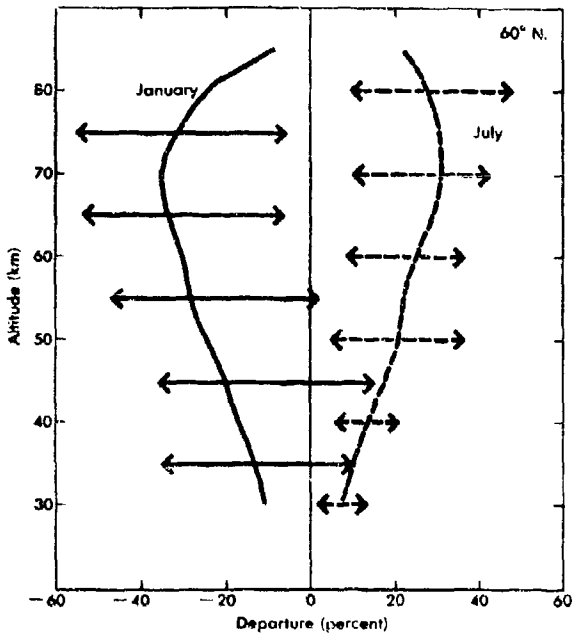

FIGURE 2.16.—Approximate 95 percent range of observed values (indicated by arrows) around the density-altitude profiles for the January and July 60° N. Supplementary Atmospheres.

mately 15 percent higher than Standard at 90 km. At higher altitudes the spread of data continues. The measurements range from several percent less to 65 percent more than Standard at 100 km and at 110 km from 20 percent less to 62 percent more than Standard. At 110 km the July measurements deviate from Standard by −15 and +5 percent. The density deviations of three November and three February measurements lie between +13 and +62 percent, with a mean of about +36 percent. Two February measurements have negative deviations at 110 km. It is believed that these do not represent typical winter conditions, but tropical conditions. Since 30° latitude is relatively close to 15° latitude, where there is no winter, there must be a large gradient in temperature and density between these two latitudes, and thus large variations in the properties at 30° latitude during the winter would be expected.

Mean seasonal curves have been deduced from the data in Figure 2.23 and plotted in Figure 2.24. Data from the two July measurements were used to produce

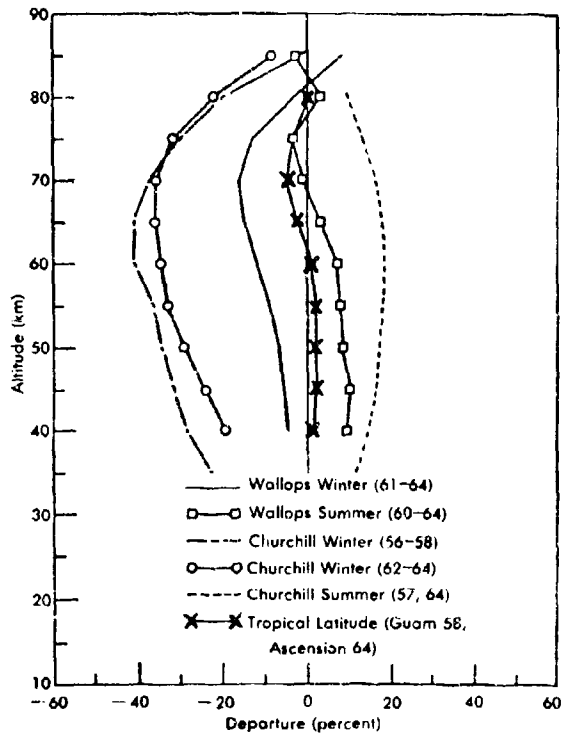

FIGURE 2.17.—Departures of mean rocket grenade pressures from Standard for summer and winter at four locations.

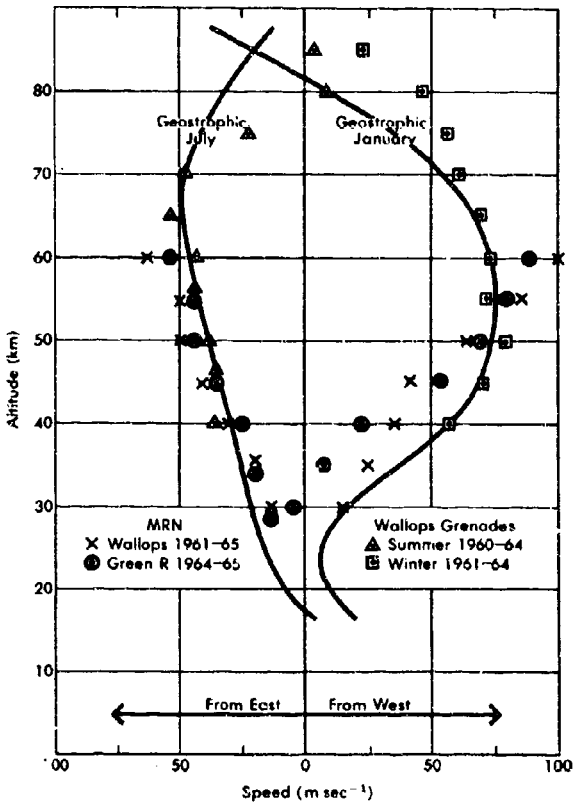

FIGURE 2.18.—Zonal wind components between 30° and 45° N.

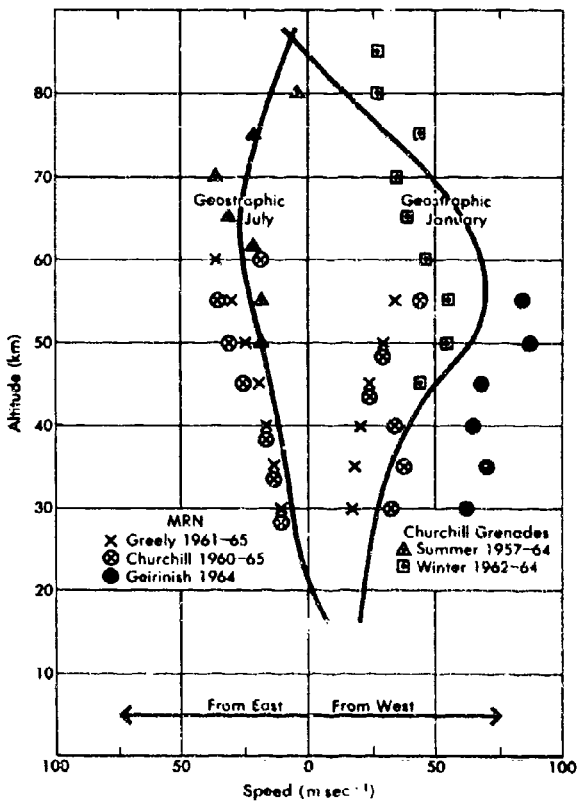

FIGURE 2.19.—Zonal wind components between 45° and 60° N.

the summer curve and the other ten measurements were grouped together to yield the winter curve. The 30° N. suggested summer and winter density curves are also plotted for comparison (Figure 2.24). The mean winter density curve is in very good agreement with the suggested curve up to 150 km, above that altitude the agreement is fair. The difficulty arises from the great variability of the atmosphere in this region (see Figure 2.23). This is also demonstrated by the sharp change in the mean density curve at 110 km. Up to 110 km the curve is the mean of results from ten rocket flights. Above this level it is the mean of two flights. It is obvious that the results of the latter measurements are significantly different from the mean of the other eight measurements. For the same reason the significance of the summer curve (based on only two rocket flights) is not high.

Figure 2.25 contains the results of three recent winter experimental observations at Churchill, Canada (Faire and Champion, 1966) obtained during the IQSY. The flights were made after completion of the models contained in this book. Thus, the relatively good agreement between the results and the other curves in Figure 2.25 constitutes confirmation of the models. The comparison curves are the 60° N. winter mean model and the 60° N. winter cold and warm models.

Other data that have been analyzed include the results of two pitot-static rocket probes at Wallops Island. The flights were made on 6 June and 1 December 1962 by Taeusch and Nagy (1965). The data, shown in Figure 2.26, agree with the general trends of other data as represented by the suggested 45° N summer and winter density curves. The very high winter density values above 100 km may be partly attributed to outgassing effects.

The results of eight density measurements at Woomera, Australia, using radar tracked inflatable spheres (Pearson 1965), are plotted in Figure 2.27. It can be seen by comparison with Figure 2.23 that, in general, the data are very similar to those obtained at the corresponding latitude in the northern hemisphere. The suggested summer and winter models for 30° N. are also shown in Figure 2.27. However, there are some differences in the data. For example, near 70 km the Woomera data show a region where the densities are higher than Standard and this does not occur in the Eglin and White Sands data in Figure 2.23. An isopycnic level still appears to exist near 90 km, but the average density is 32 percent above Standard, as compared to 15 percent for northern hemisphere data. However, it is not clear whether these differences are the result of different measuring techniques, of relatively small samples, of differences

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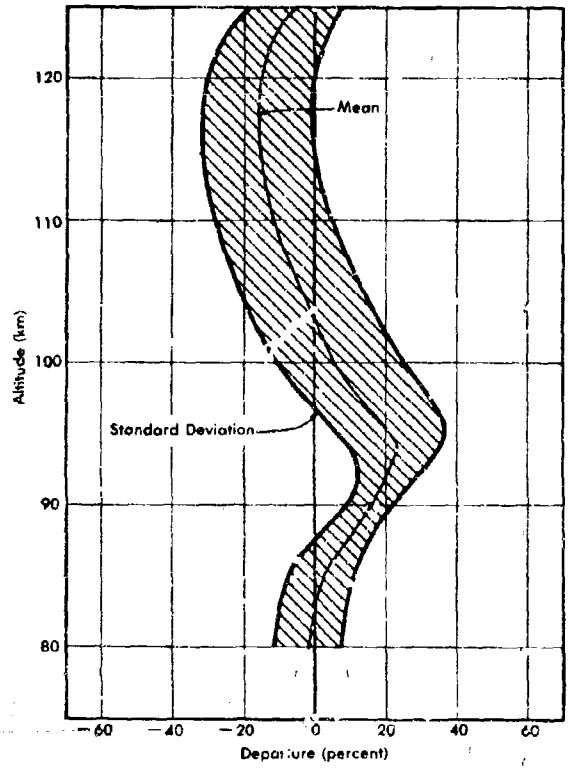


FIGURE 2.20.—Departures from Standard of the mean and standard deviations of 13 density measurements at Kwajalein Island.

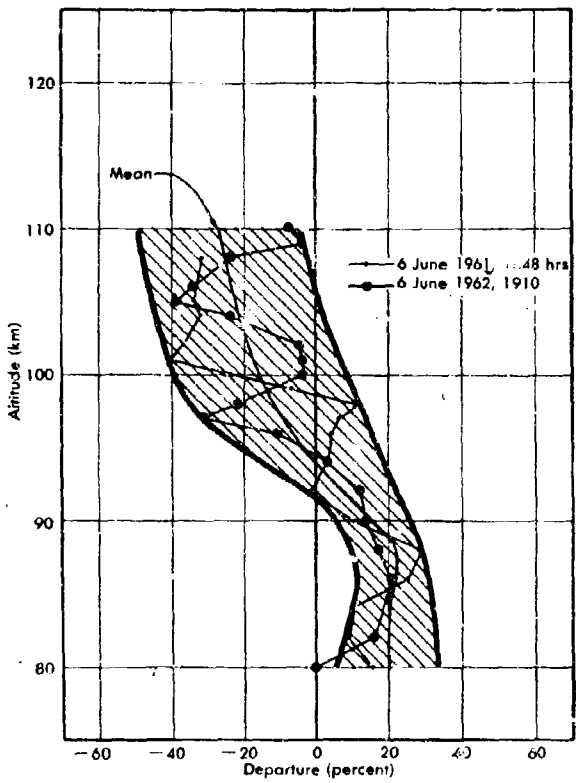


FIGURE 2.21.—Departures from Standard of two falling sphere density measurements at Wallops Island.

between the northern and southern hemispheres, or of longitudinal effects.

Values of oxygen (O_2) density as a function of altitude (Jursa et al., 1965) obtained by various experimenters are shown in Figure 2.28. The O_2 density is determined primarily by the total atmospheric density but also, above about 100 km, by any large variations in the degree of dissociation (that is, the magnitude of the O density). Thus, at high altitudes the percentage variation in O_2 density will be larger than in the total density. Like the total density, the observed O_2 density has small variability at 90 km. The variation increases with altitude and is large at 120 km and higher altitudes. It is interesting to note that in Figure 2.28 the highest O_2 densities at 120 km and adjacent altitudes are those of the theoretical models of Harris and Priester (1962). These authors developed a revised set of models, published as part of CIRA 1965, in which the O_2 density at 120 km has been reduced from 1.2×10^{11} cm^{-3} to 7.5×10^{10} cm^{-3}. The new value is almost identical with that at the 120 km end of the line drawn by Jursa et al. in Figure 2.28. Up to 150 km the theoretical values agree almost exactly with Hinteregger's (1961) experimental values indicated by crosses in the figure.

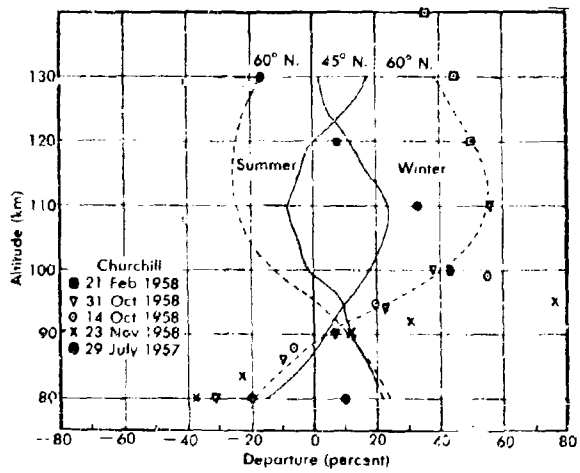


FIGURE 2.22.—Departures from Standard of IGY Churchill density data and of early curves for winter and summer 45° and 60° N.

Most values of temperature obtained for the upper atmosphere are derived, in principle, from the slope of density curves. These yield scale height or molecular temperature. At altitudes where oxygen dissociation is not significant, molecular temperature is the

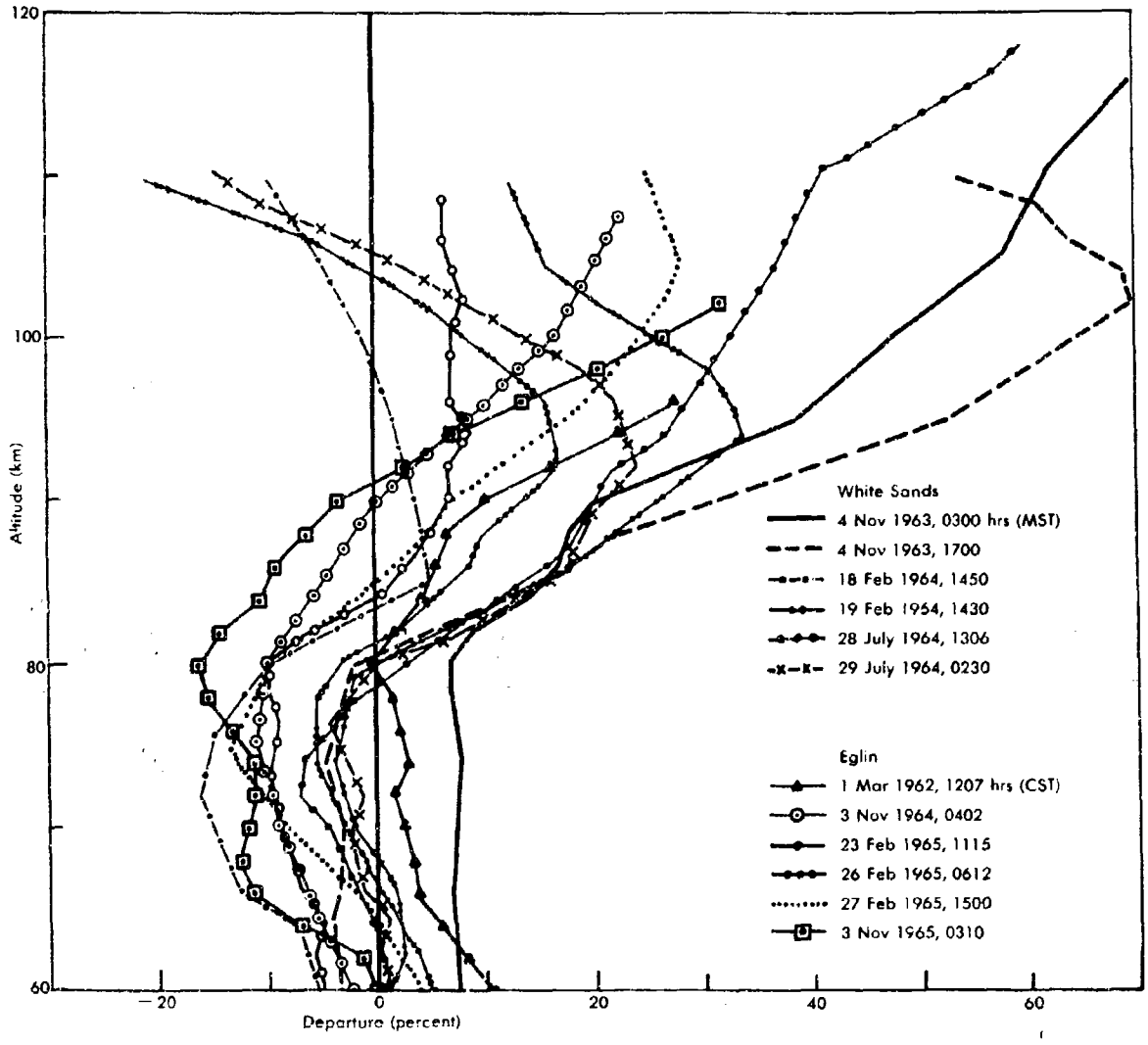


FIGURE 2.23.—Departures from Standard of 12 recent density measurements at White Sands and Eglin.

same as kinetic temperature. At higher altitudes, values of the mean molecular weight must be known to deduce the kinetic temperature. Values of kinetic temperature can be deduced directly in the region of diffusive separation if the altitude profile of a single constituent, such as N_2 or O_2, is measured. Independent methods of measuring kinetic temperature directly are mainly optical in nature. They include measurements of the Doppler broadening of resonance radiation from sodium or potassium and the deduction of temperature from the band emission of aluminum oxide by Armstrong (1963) and Blamont (1964).

Temperatures can also be measured on a synoptic basis by measuring the Doppler width of the atomic oxygen airglow lines. This is particularly convenient to do with the 5577 Å line. This line is primarily emitted in the vicinity of 95 km, at or near the mesopause, a region of minimum temperature. Armstrong (1959) has obtained a considerable amount of temperature data from observations on the 5577 Å line. The results of 15 early measurements gave temperatures in the range 180° to 220° K, with a median value of 190° K. More recent results have sometimes yielded temperatures as low as 150° K and, on the other hand, sometimes as high as several hundred degrees. In the latter case, Armstrong believes that the observed radiation must be coming largely from higher altitudes, near where the red line (6300 Å) is emitted.

Recent data include those of Hernandez and Turtle (1965). The temperatures measured at Bedford, Massachusetts (November, 1964 to February, 1965) lie between 150 and 260° K, with a mean of 210° K. This compares favorably with a kinetic temperature of 208.5° K at 95 km in the 45° N. winter model. The

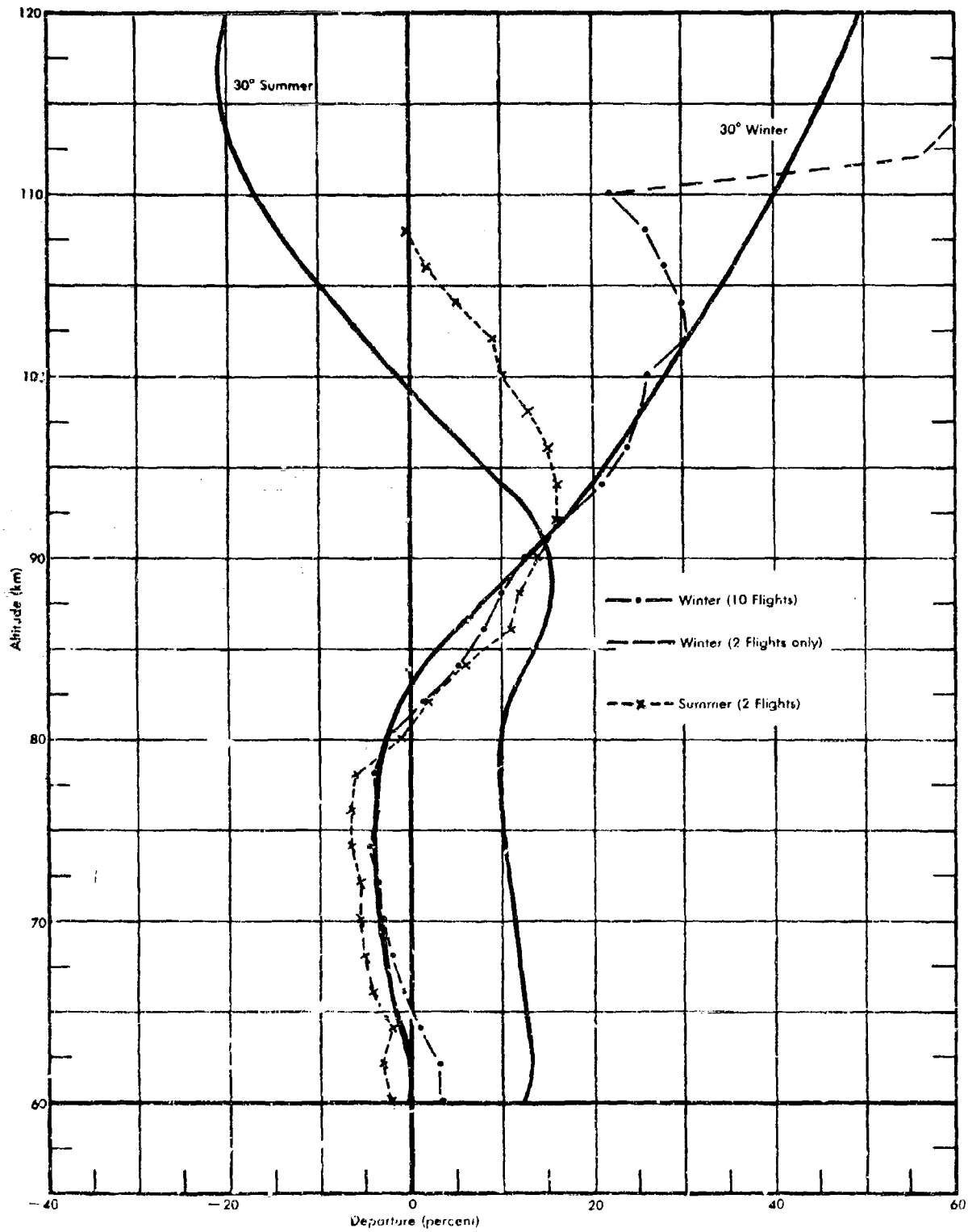


FIGURE 2.24.—Mean summer and winter density data for White Sands and Eglin compared with idealized (Figure 2.7) 30° N. summer and winter density curves.

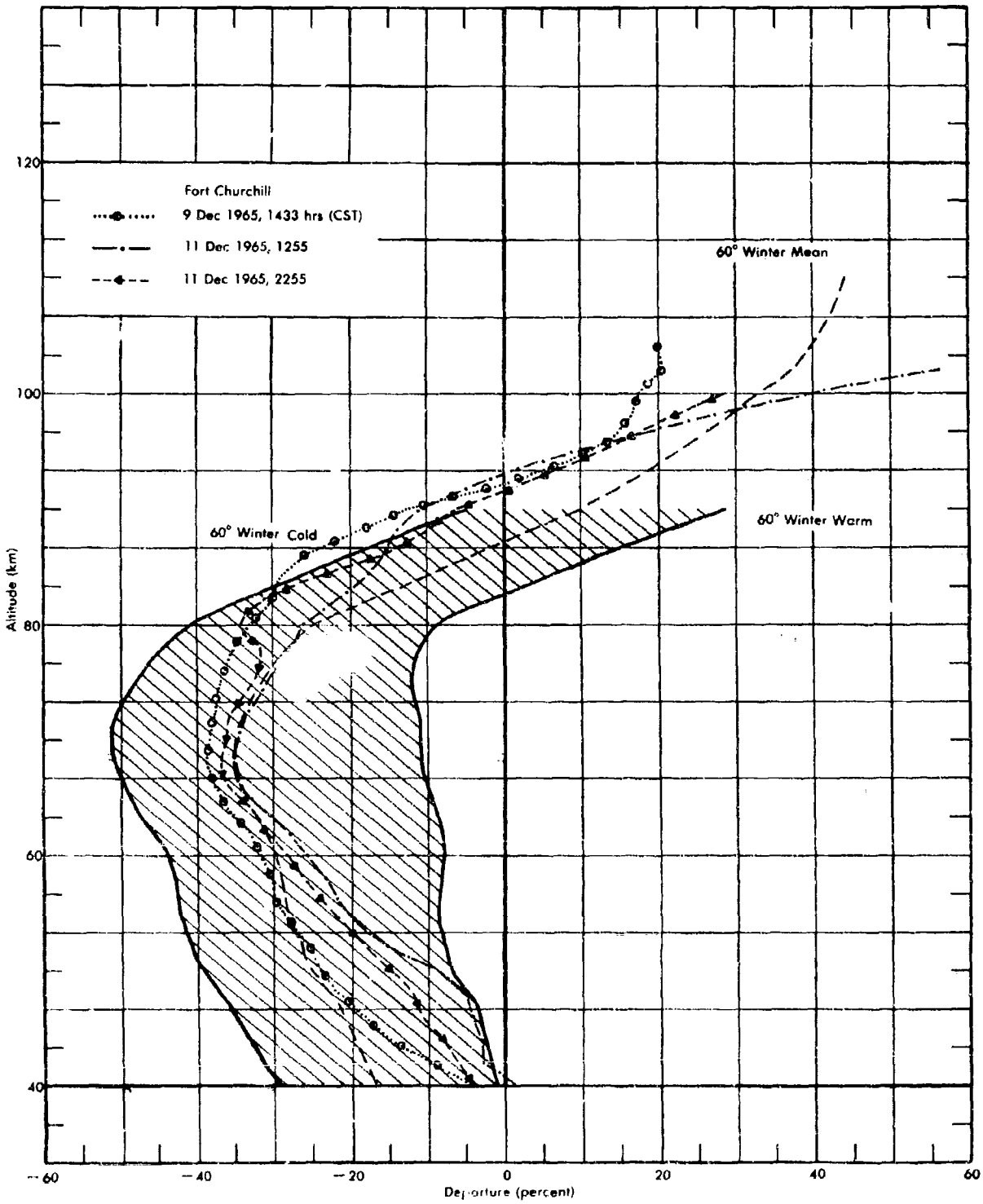


FIGURE 2.25.—Departures from Standard of the densities from three recent measurements at Churchill and of the 60° N. winter mean, cold and warm models.

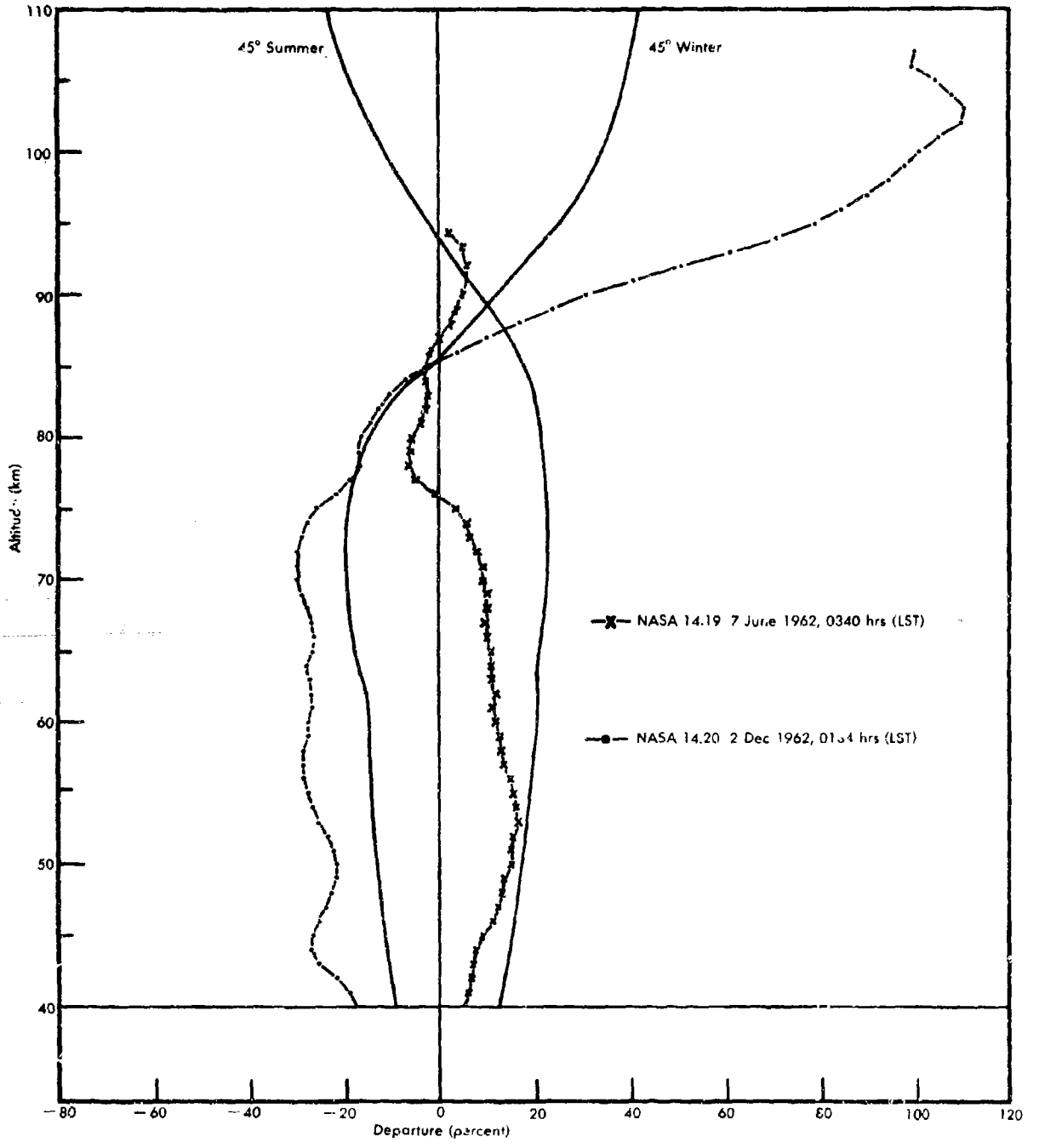


FIGURE 2.26. – Departures from Standard of two pitot-static density measurements at Wallops Island and of the idealized (Figure 2.7) 45° summer and winter density curves.

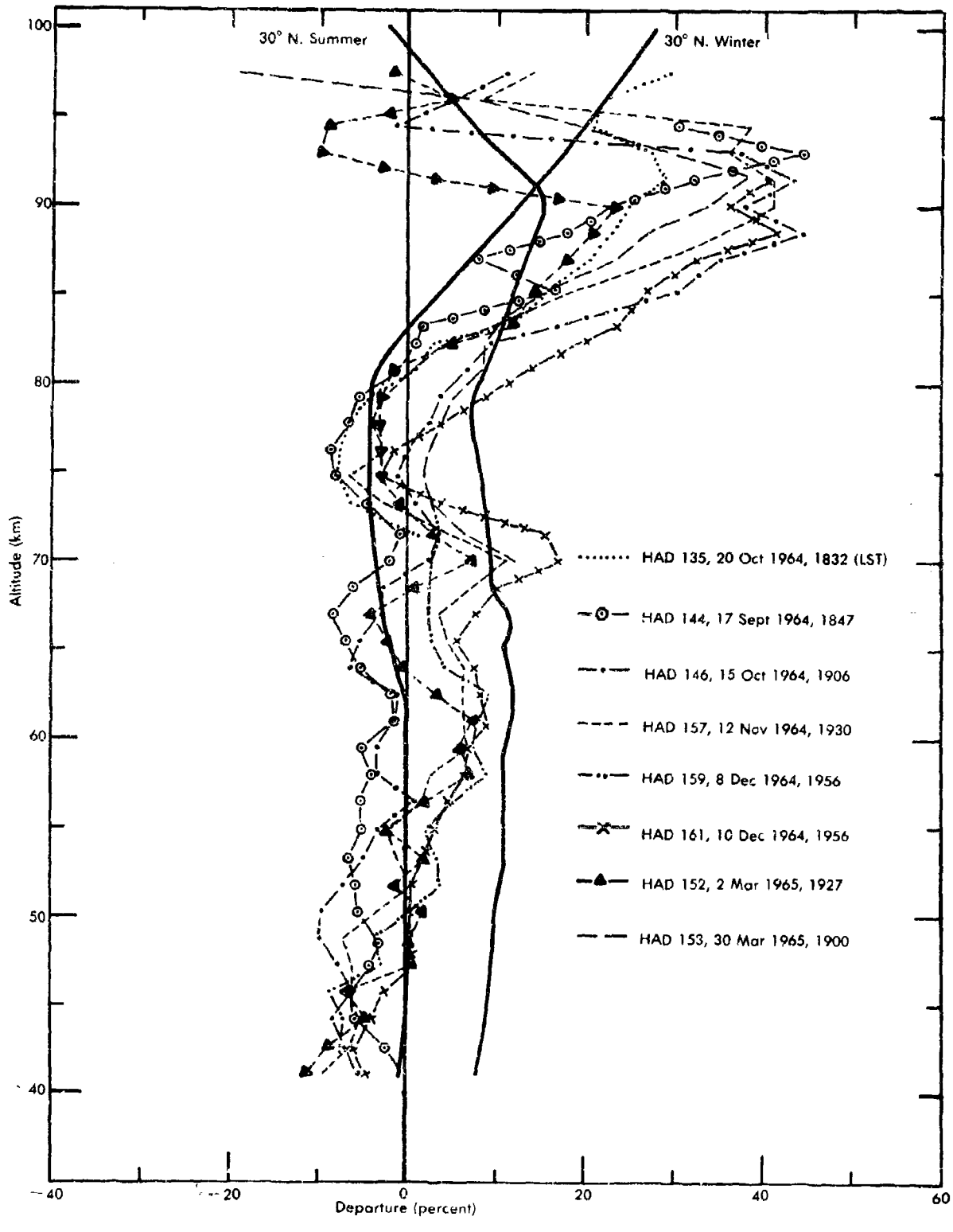


FIGURE 2.27.—Departures from Standard of eight density measurements at Woomera and of the summer and winter models for 30° N.

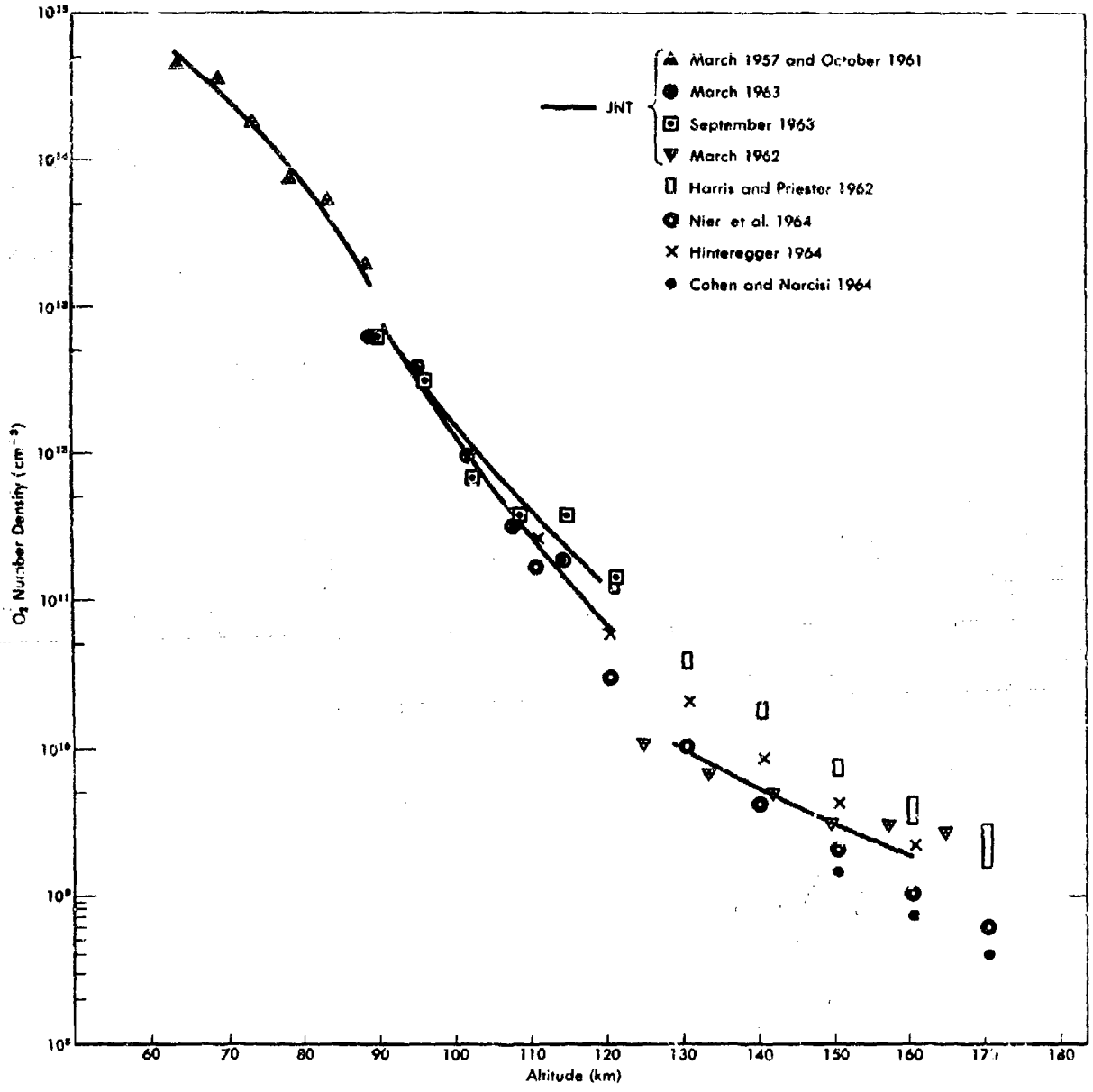


FIGURE 2.28. -Molecular oxygen number density data between 60 and 170 km.

observed temperatures showed fluctuations up to 65° in time intervals of the order of 10 to 20 minutes. For example:

7 January 1965	
EST	°K
0410	211
0427	150
0445	210

Certainly, from energy considerations, the average temperature of the atmosphere cannot fluctuate in this way. Assuming that the fluctuations are not instrumental or due to processes peculiar to the excited oxygen atom, one notes that they suggest a fine structure in the atmosphere near 95 km. The instrument views a cross-sectional area with a diameter of 300 m. Zimmerman (1966) believes that large eddies exist at this altitude with diameters in the range 300 m to 2 km. It is possible that a part of the observed variability is due to the temperature fluctuations associated with these eddies.

PART 3

Atmospheric Models Above 120 Kilometers

3.0 INTRODUCTION

The basic defining parameter of the Supplementary Atmospheres above 120 km is a family of exponential temperature curves. These were empirically derived so as to provide density-altitude profiles which are in agreement with satellite-drag derived densities for various degrees of solar and geomagnetic activity and varying solar angles. Such a family of atmospheres was defined for one boundary condition of temperature, pressure, density, and molecular weight at its base, 120 km, by Jacchia (1965) and can be considered to represent the annual mean or spring and fall conditions in lower layers. However, the eight supplementary atmospheres below 120 km converge at three separate and distinct boundary conditions at 120 km and new mathematical treatment was required to join these families realistically.

Tables of atmospheric properties for 120 to 1000 km, the development of which is covered in this Part, are provided in Part 6

3.1 CONSTRUCTION OF ATMOSPHERIC MODELS FOR ALTITUDES ABOVE 120 KILOMETERS

3.1.1 SPRING/FALL MODELS.—For altitudes above 120 km the spring/fall atmospheric models presented here are identical with Jacchia's (1965) static diffusion models. Winter and summer models, which start from different boundary conditions at 120 km, join the spring/fall models at altitudes near 225 km. A description of the method followed in joining the homosphere and heterospheric models is given in Section 3.1.2. Here we shall give a brief description of how the spring/fall models were constructed.

These models assumed the following set of fixed boundary conditions at 120 km:

$T = 355.0°$ K

$\rho = 2.461 \times 10^{-11}$ gm cm^{-3}

$M = 26.90$

$n(N_2) = 4.0 \times 10^{11}$ cm^{-3}

$n(O_2) = 7.5 \times 10^{10}$ cm^{-3}

$n(O) = 7.6 \times 10^{10}$ cm^{-3}

$n(He) = 3.4 \times 10^{7}$ cm^{-3}

This is the same set of boundary conditions that had been selected for the construction of the COSPAR International Reference Atmosphere 1965 (CIRA, 1965) except for argon, which was neglected in view of its small contribution to the total density, and helium which has a density of 2.4×10^{7} cm^{-3} in CIRA. As a result of these changes ρ and M are also slightly different.

Above 120 km, diffusive equilibrium was assumed, and the number density n_i of each constituent i was computed as a function of the geometric altitude Z by integrating the diffusion equation:

$$\frac{dn_i}{n_i} = -\frac{dZ}{H_i} - \frac{dT}{T}(1+\alpha). \tag{3.1}$$

Here, T is the temperature, α the thermal-diffusion factor, and H_i the scale height of the individual constituent, defined by

$$H_i = \frac{kT}{m_i g} \tag{3.2}$$

where k is the Boltzmann constant, m_i the molecular (or atomic) mass of the constituent, and g the acceleration of gravity. For helium, following Kockarts and Nicolet (1962), a value $\alpha = -0.38$ was adopted; for N_2, O_2, and O it was assumed that $\alpha = 0$.

Hydrogen was assumed to be in diffusive equilibrium above 500 km, although this assumption is not entirely justified for temperatures above 1500° K. The values of n(H) at 500 km were taken from Kockarts and Nicolet (1962, 1963), or rather the empirical equation

$$\log_{10} n(H) = 73.13 - 39.40 \log_{10} T + 5.5 (\log_{10} T)^2 \tag{3.3}$$

was taken to represent their numerical data.

Below 500 km it is known that hydrogen is not in diffusive equilibrium, but at the moment, theory is not adequate to calculate the density profile due to lack of knowledge of the flow rate.

A family of temperature profiles, which approach different asymptotic exospheric temperatures, was constructed by assuming exponential curves of the form

$$T = T_\infty - (T_\infty - T_{120}) \exp[-s(Z-120)] \tag{3.4}$$

where T_∞ is dependent on solar activity and other parameters and T_{120} is the boundary temperature at 120 km. All temperatures are in °K, Z is in kilometers, and s is a constant, different for each profile

and therefore a function of T_∞. Appropriate values of s such that realistic density variations are generated from the temperature profiles are determined by the empirical equation

$$s = 0.0291 \exp\left(-\frac{q^2}{2}\right) \tag{3.5}$$

where

$$q = \frac{T_\infty - 800}{750 + 1.722 \times 10^{-4}(T_\infty - 800)^2}$$

Once a set of models for a wide range of T_∞ was constructed, the problem remained of relating T_∞ to the various parameters that characterize the different factors of atmospheric variation: solar and geomagnetic activity, location of the observer with respect to the sun, and so forth. Equations and tables for these conditions, based on Jacchia (1965), are given in Section 3.2.

3.1.2 SUMMER AND WINTER MODELS.—As shown in Figure 2.7 (Champion, 1966) the eight supplementary atmospheres below 120 km converge at three different density values at 120 km. Starting with these boundary conditions, one observes that three sets of high-altitude models were developed: a single set applicable to transition season (spring and fall) conditions, a set for summer, and a set for winter. In order to represent atmospheric behavior observed at various times of day during an entire solar cycle, models with a range of exospheric temperatures from 600° to 2100° K were prepared.

The summer and winter atmospheres merge with the spring/fall atmospheres at altitudes near 225 km. The matching altitude depends on exospheric temperature and season. Thus, corresponding to each exospheric temperature, there are three models below the matching altitudes and a single model above.

In Figure 3.1 density departures are plotted for three typical cases corresponding to exospheric temperatures of 600°, 1500°, and 2100° K. For each exospheric temperature the reference line corresponds to a different density profile and furthermore the matching altitude Z_m is different. In fact, the matching altitude lies within the range 195 to 255 km, depending upon the exospheric temperature and season. One condition that can be satisfied by varying the matching altitude is the requirement that all the summer models have the same temperature at 120 km, so that they can be matched to the low-altitude models. Similarly, all the winter models must have the same temperature at 120 km. The matching altitudes for the summer and winter atmospheres are given in Table 3.1 and in Figure 3.2. For temperatures above 1300° K it can be seen that the summer and winter values of Z_m are the same.

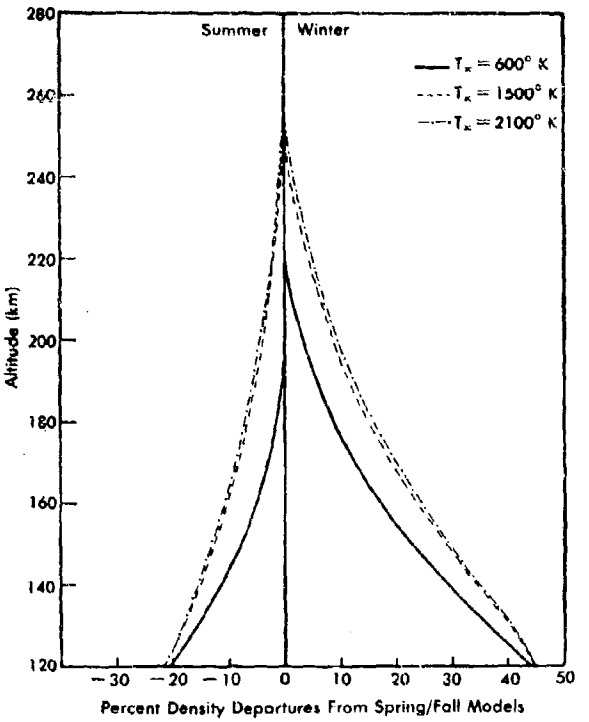


FIGURE 3.1.—Density departures from the spring/fall models for summer and winter with three exospheric temperatures.

TABLE 3.1.—MATCHING ALTITUDES (Z_m) FOR SUMMER AND WINTER ATMOSPHERES AS A FUNCTION OF EXOSPHERIC TEMPERATURE

T_∞ °K	Z_m (Summer) km	Z_m (Winter) km
600	195	220
700	200	225
800	210	230
900	220	235
1000	230	240
1100	235	240
1300	245	245
1500	250	250
1700	255	255
1900	255	255
2100	255	255

The mathematical functions chosen to represent winter and summer density curves are

$$\rho_w = \rho_j(1.4848 - 0.4848\ \psi) \tag{3.6}$$

and

$$\rho_s = \rho_j(0.7919 + 0.2081\ \psi) \tag{3.7}$$

where

$$\psi = \tanh 1.75\ D + 0.059\ D^2 \tag{3.8}$$

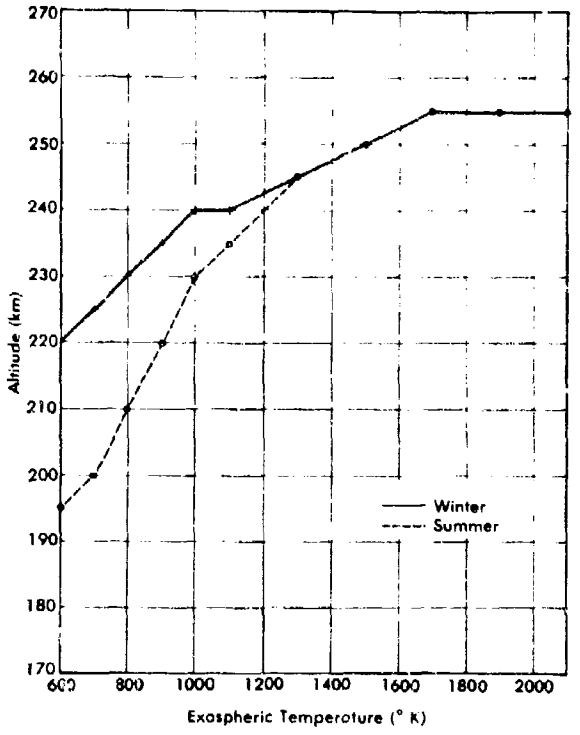


FIGURE 3.2.– Matching altitudes (Z_m) for summer and winter atmospheres as a function of exospheric temperature.

and

$$D=\frac{Z-120}{Z_m-120} \tag{3.9}$$

where ρ_j designates the appropriate density value from Jacchia's (1965) models, ρ_w the winter density, ρ_s the summer density, ψ a parameter defined by Eq. (3.8), and D a parameter defined by Eq. (3.9).

In Part 6 tables are given for models with exospheric temperatures of 600°, 700°, 800°, 900°, 1000°, 1100°, 1300°, 1500°, 1700°, 1900°, and 2100° K. The following procedure was used to obtain the values in the tables. Molecular-scale temperatures were calculated from the density curves described by Eqs. (3.6) and (3.7) using integration downward from the matching altitude. To convert to kinetic temperature, the molecular weight values of the spring/fall models were used as a first estimate. With this temperature profile, and boundary conditions for $n(O_2)$, $n(O)$, $n(N_2)$, and $n(He)$ that were the spring/fall values multiplied by 1.4848 and 0.7919 for winter and summer models, respectively, a new set of tables was computed. Molecular weights obtained by this process were used with the T_M profile to obtain a revised set of kinetic temperatures. By an iterative process in which the temperature profile and boundary conditions were adjusted slightly, the summer and winter models were matched to the corresponding spring/fall models at Z_m and above.

The density departures shown in Figure 3.1 are replotted in Figure 3.3, but in this case the reference is the *1962 Standard*. Densities are shown for an exospheric temperature of 600° K, separating below 200 km into curves for summer, winter, and spring/fall. Densities corresponding to exospheric temperatures of 1500° K and 2100° K are similarly represented. The density departures at 300 km for models with exospheric temperatures of 900°, 1100°, 1300°, 1700°, and 1900° K are also marked.

Figure 3.4 illustrates percentage density departure from the *1962 Standard* at all latitudes corresponding to 1400 hours local time at the northern hemisphere summer solstice when the maximum daytime exospheric temperature is 1200° K. This figure is based on the type of temperature distribution in Figure 3.5.

Figure 3.6 contains typical summer, winter, and spring/fall temperature profiles for 45° latitude from sea level to an altitude of 300 km. The three temperature curves which start at 120 km and extend towards 300 km are plotted from values for the 1500° K exospheric temperature models in Part 5. The mean temperature curve from sea level to 120 km is the *1962 Standard*, whereas the summer and winter temperature profiles up to 120 km are obtained from the appropriate tables in Part 5.

The values shown in Figure 3.6 are typical. Actual values at any particular time will depend on the latitude and, at the higher altitudes, also on solar flux and time of day. The present models are the first in which variations in temperature and density as functions of latitude, season, and other parameters are given continuously and at all altitudes from sea level to 1000 km. Figure 3.7 is the density plot appropriate to a maximum daytime exospheric temperature of 1500° K. It should be noted that, at the higher altitudes, the densities are larger in comparison with the Standard than those plotted in Figure 3.4.

The boundary conditions at 120 km of the high altitude Supplementary Atmospheres are given in Table 3.2. It can be seen that each of the tabulated quantities varies with season.

3.2 SYSTEMATIC VARIATIONS IN THE ATMOSPHERE ABOVE 200 KILOMETERS

Four types of atmospheric variation have been recognized at heights greater than 200 km, namely:

1. a variation with solar activity,
2. a semiannual variation,
3. a diurnal variation, and
4. a variation with geomagnetic activity.

Each of these variations has been found to be related to one or more observable parameters, and empirical formulas have been constructed to compute

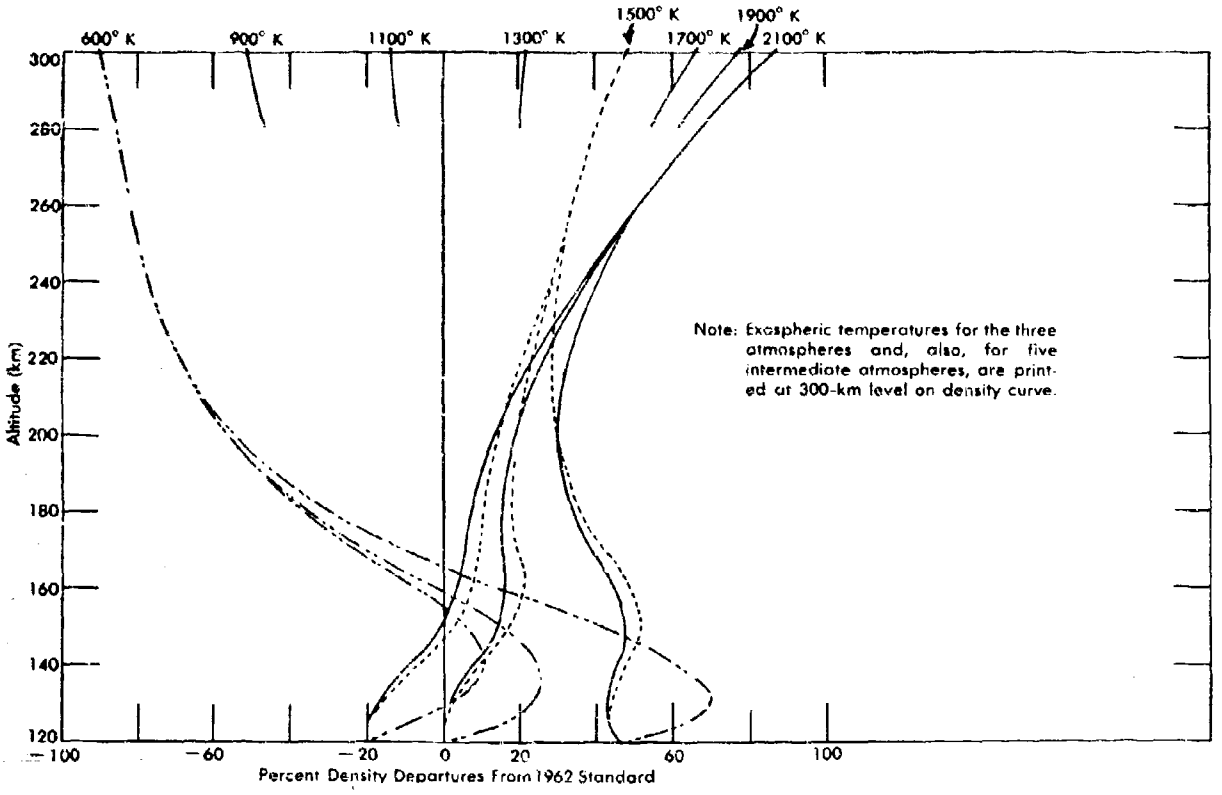


FIGURE 3.3.—Departures from Standard of densities for summer, winter and spring/fall models with three exospheric temperatures.

the exospheric temperature when these parameters are known. Once the exospheric temperature T_∞ has been computed, atmospheric densities and related quantities can be found for any given height by interpolation between the individual profiles given in the Tables in Part 5. Following is a brief summary of the formulas to be used for computing T_∞. The order in which the types of variation are listed does not reflect their relative importance; it is dictated by the sequence in which the computations to obtain T_∞ are to be performed.

3.2.1 VARIATIONS WITH SOLAR ACTIVITY.—The parameter that can be used to best advantage to characterize solar activity is the 10.7-centimeter flux which is monitored by the National Research Council in Ottawa, Ontario. The relation between this flux and T_∞ is different, however, according to whether we consider the slow 11-year cycle variation or the day-to-day variation within one 27-day solar rotation.

Variation with the solar cycle.—Let $\overline{F}_{10.7}$ be the 10.7-cm solar flux in units of 10^{-22} watts/m^2/cycle/sec averaged over three solar rotations, and $\overline{T}_0$ the nighttime global minimum value of exospheric temperature averaged over the same time interval. The formula

$$\overline{T}_0 = 362 + 3.60\,\overline{F}_{10.7} \qquad (3.10)$$

gives the relation between these two quantities for absolutely quiet geomagnetic conditions, that is when the 3-hour geomagnetic planetary index is zero. If a relation for average quiet geomagnetic conditions ($\overline{K}_p = 2$) is desired, the absolute term should be changed from 362 to 418.

TABLE 3.2 BOUNDARY CONDITIONS OF SUPPLEMENTARY ATMOSPHERES, $Z = 120$ KILOMETERS

	T °K	*log n(O_2)	*log n(O)	*log n(N_2)	*log n(He)	M	H km	P mb	ρ kg m^{-3}
Summer	379.7	16.759	16.808	17.497	13.502	26.76	12.49	2.283×10^{-5}	1.935×10^{-8}
Winter	353.5	17.056	16.958	17.764	13.568	27.12	10.83	3.641×10^{-5}	3.561×10^{-8}
Spring/Fall	355.0	16.875	16.881	17.602	13.531	26.90	11.62	2.700×10^{-5}	2.461×10^{-8}

*n(O_2), n(O), n(N_2), and n(He) are in m^{-3}.

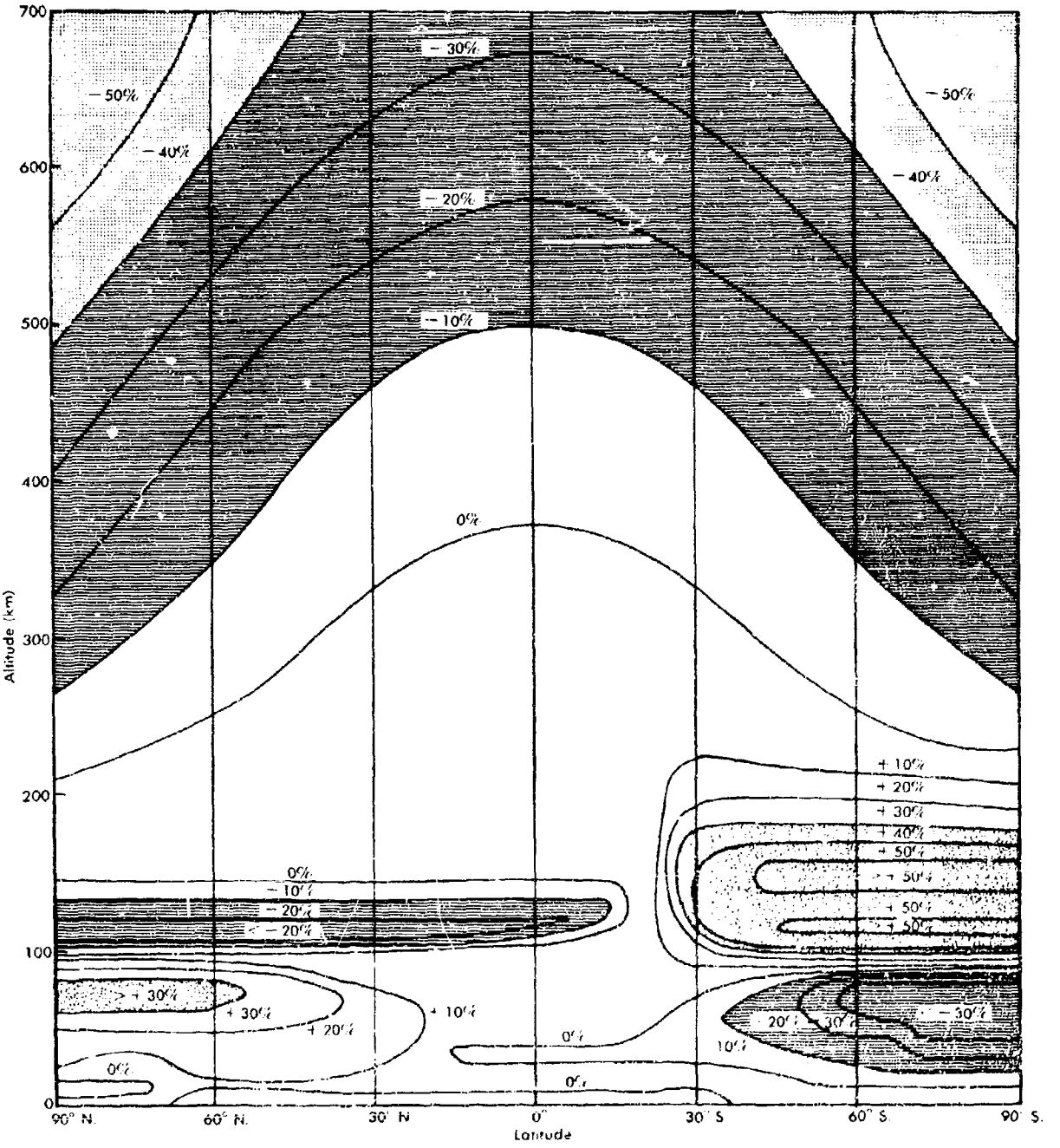


FIGURE 3.4.—Contours of percentage departures of density from Standard at all latitudes corresponding to 1400 hours local time at northern hemisphere summer solstice with an equatorial bulge and a maximum exospheric temperature of 1200° K.

Variation within one solar rotation.—Let $F_{10.7}$ be the daily mean of the 10.7-cm solar flux in the source units as above. We can account approximately for the day-to-day temperature variation superimposed on the 11-year cycle variations by using the formula

$$T_0 = \bar{T}_0 + 1.8\,(F_{10.7} - \bar{F}_{10.7}) \qquad (3.11)$$

Here T_0 is the nighttime global minimum of the exospheric temperature corrected for the day-to-day variation in solar flux. There is some indication that the numerical coefficient in this formula might be somewhat smaller (1.5) near sunspot minimum and larger (possibly 2.4) near sunspot maximum.

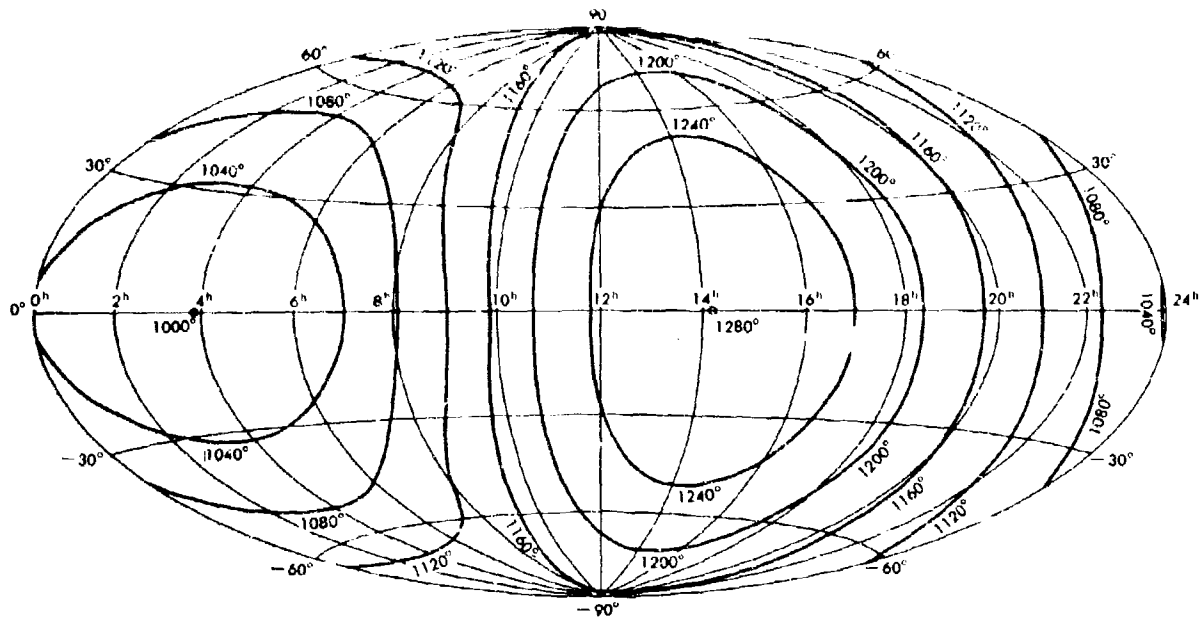


FIGURE 3.5.—Temperature distribution above the thermopause according to Eqs. (3.13) and (3.14), for the case when $T_0 = 1000°$ K. Hours of local time, counted from midnight, are marked on the equator. (Aitoff's equal-area projection.)

3.2.2 SEMIANNUAL VARIATION.—The amplitude of this variation is a function of the solar cycle and can be related to $\overline{F}_{10.7}$ by

$$T_0 = T_0' + f(d)\overline{F}_{10.7} \tag{3.12}$$

where

$$f(d) = \left(0.37 + 0.14 \sin 2\pi \frac{d-151}{365}\right) \sin 4\pi \frac{d-59}{365}$$

and d is the number of days elapsed since January 1 of each year. T_0 is the nighttime global minimum exospheric temperature. The combination of these two sine terms produces two unequal maxima and two unequal minima in the course of the year: a secondary minimum on 8 January, a secondary maximum on 20 April, a primary minimum on 18 July, and a primary maximum on 14 October. Table 3.3 gives values of $f(d)$ for the 1st, the 11th and the 21st day of each month.

3.2.3 DIURNAL VARIATION.—The distribution of exospheric temperature on the globe is such that the maximum is observed around 1400 hours local solar time, and the minimum around 0400 hours; both the maximum and the minimum are located at low latitudes. Since atmospheric densities at heights above 200 km are greater when the temperature is higher, the atmosphere bulges out slightly in the bright hemisphere, producing what is often referred to as the "diurnal bulge." Let ϕ_B be the latitude of the center of the bulge, that is, of the point where the highest exospheric temperature, T_X, is observed. Satellite drag data from 1958 to 1965 have shown that the ratio T_X/T_0 is nearly constant; we shall write

$$\frac{T_X}{T_0} = 1 + R$$

The daytime-maximum temperature T_D and the nighttime minimum temperature T_N at any given latitude ϕ can be related to the nighttime minimum global temperature by

$$\begin{aligned} T_D &= T_0(1 + R\cos^m \eta) \\ T_N &= T_0(1 + R\sin^m \theta) \end{aligned} \tag{3.13}$$

TABLE 3.3 VALUES OF THE FACTOR $f(d)$ FOR COMPUTING THE SEMIANNUAL EFFECT

$f(d)$	$f(d)$	$f(d)$	$f(d)$
Jan 1 −0.267	Apr 1 +0.218	Jul 1 −0.383	Oct 1 +0.434
11 −0.276	11 +0.259	11 −0.453	11 +0.472
21 −0.255	21 +0.275	21 −0.469	21 +0.451
Feb 1 −0.203	May 1 +0.258	Aug 1 −0.418	Nov 1 +0.366
11 −0.138	11 +0.200	11 −0.312	11 +0.250
21 −0.063	21 +0.119	21 −0.163	21 +0.117
Mar 1 0.000	Jun 1 −0.010	Sep 1 +0.026	Dec 1 −0.016
11 +0.078	11 −0.143	11 +0.196	11 −0.130
21 +0.151	21 −0.273	21 +0.338	21 −0.215

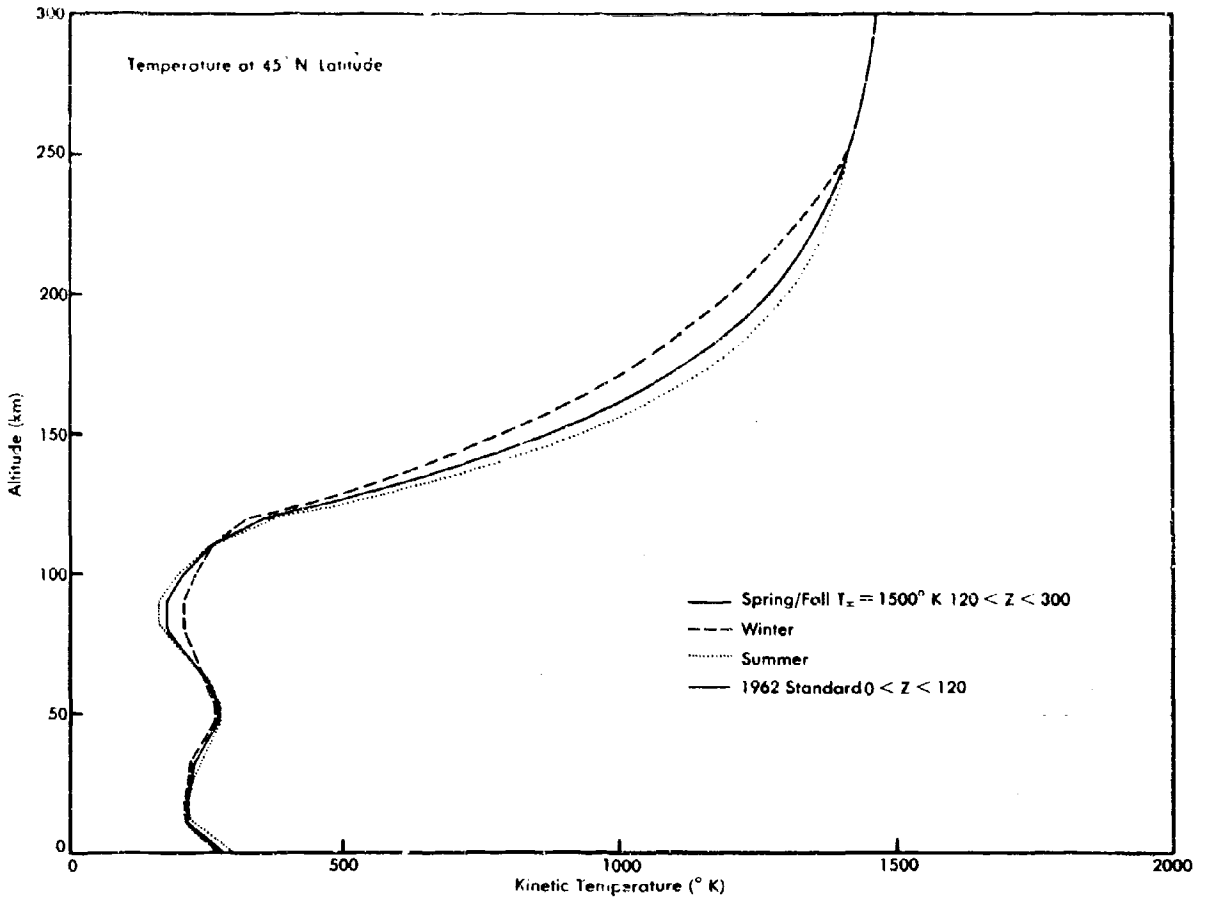


FIGURE 3.6. — Typical summer, winter and spring/fall temperatures, 0 to 300 km, for 45° latitude with an equatorial bulge.

where

$$\eta = \frac{1}{2}|\phi - \phi_B| \text{ and } \theta = \frac{1}{2}|\phi + \phi_B|$$

As can be seen, the exponent m controls the temperature decay from the center of the bulge in the north-south direction.

We shall represent the diurnal variation at a given latitude ϕ by

$$T = T_N\left(1 + A\cos^n\frac{\tau}{2}\right) \tag{3.14}$$

where

$$A = \frac{T_D - T_N}{T_N} = R\frac{\cos^n\eta - \sin^m\theta}{1 + R\sin^m\theta}$$

Here τ is a function of H^*, the hour angle of the sun, that is, of the local solar time counted from culmination. This function must account for the asymmetry between the morning rise and evening decline of temperature, and for the difference in sharpness between the maximum and the minimum in the temperature curve. A suitable expression for τ is

$$\tau = H^* + \beta + p\sin(H^* + \gamma) \qquad (-\pi < \tau < \pi) \tag{3.15}$$

In an earlier version of this model (Jacchia, 1964), the latitude of the bulge, ϕ_B, had been assumed to be the same as that of the subsolar point (that is, $\phi_B = \delta_\odot$, where $\delta_\odot$ is the declination of the sun), and the same value had been assigned to the exponents m and n. Information from the high-inclination satellites Explorer XIX and Explorer XXIV has led to a revised version of the model (Jacchia and Slowey, 1966), in which the bulge never moves much from the equator ($\phi_B \approx 0$) and is elongated in the north-south direction ($m < n$). This seems, at least, to be the picture of the bulge above the $F2$ layer. There is good indication that at lower altitudes the earlier version of the bulge might be correct, in which case m and ϕ_B would become functions of altitude or, better, functions of density.

234 458 O 67 - 5

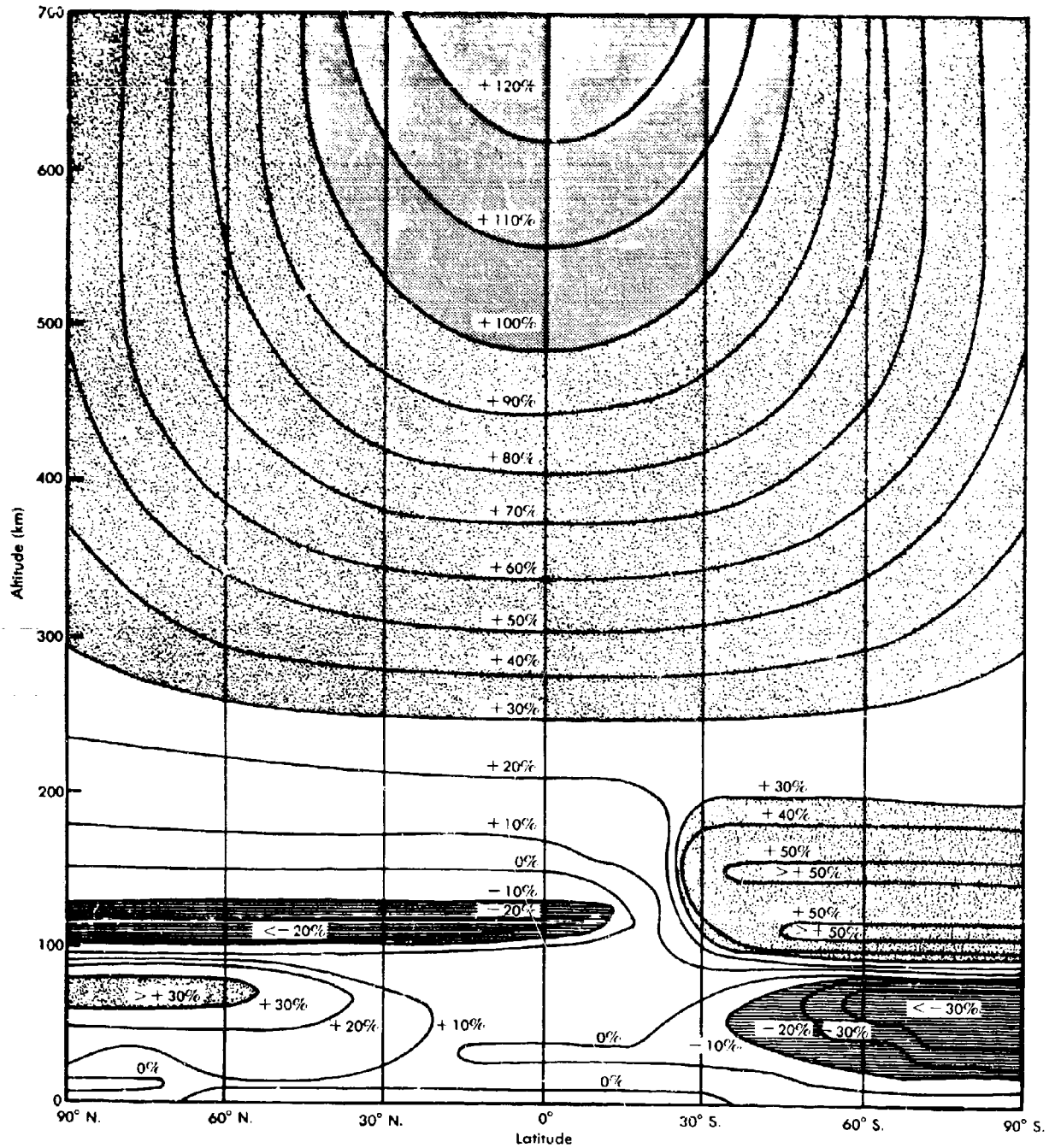


FIGURE 3.7.—Contours of percentage departures of density from Standard at all latitudes corresponding to 1400 hours local time at northern hemisphere summer solstice with an equatorial bulge and a maximum exospheric temperature of 1500° K.

The recommended constants for use in the diurnal-variation formulas are:

$R = 0.28$	$\beta = -45°$
$m = 1.5$	$\rho = 12°$
$n = 2.5$	$\gamma = +45°$
$\phi_n = 0$	

With these constants we always have $T_X/T_0 = 1.28$; the local solar time of the temperature minimum is 0347 hours and that of the maximum is 1413 hours. The distribution of exospheric temperature according to this model is given in Table 3.4 and shown in Figure 3.5.

TABLE 3.4 RATIO T_c OF EXOSPHERIC TEMPERATURE TO MINIMUM NIGHTTIME TEMPERATURE ON EQUATOR AS A FUNCTION OF LATITUDE AND LOCAL SOLAR TIME (HOURS FROM MIDNIGHT)

LST / Lat	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
90	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166
75	1.142	1.138	1.135	1.133	1.133	1.134	1.137	1.142	1.150	1.160	1.171	1.182	1.190	1.196	1.198	1.197	1.194	1.188	1.182	1.175	1.167	1.160	1.153	1.147
60	1.116	1.108	1.102	1.099	1.099	1.101	1.106	1.117	1.132	1.152	1.174	1.194	1.210	1.221	1.226	1.224	1.217	1.207	1.194	1.181	1.166	1.152	1.139	1.127
45	1.091	1.079	1.071	1.067	1.066	1.068	1.076	1.092	1.114	1.143	1.174	1.203	1.227	1.242	1.248	1.246	1.237	1.222	1.204	1.184	1.163	1.143	1.124	1.106
30	1.068	1.053	1.043	1.038	1.037	1.040	1.049	1.069	1.097	1.133	1.172	1.208	1.238	1.258	1.266	1.263	1.251	1.232	1.209	1.184	1.159	1.134	1.109	1.087
15	1.049	1.032	1.026	1.014	1.013	1.016	1.028	1.050	1.083	1.124	1.168	1.210	1.245	1.267	1.276	1.273	1.259	1.238	1.212	1.183	1.153	1.124	1.096	1.071
0	1.038	1.020	1.007	1.001	1.000	1.003	1.015	1.039	1.074	1.118	1.165	1.210	1.246	1.270	1.280	1.276	1.262	1.239	1.211	1.180	1.149	1.118	1.088	1.061
−15	1.049	1.032	1.020	1.014	1.013	1.016	1.028	1.050	1.083	1.124	1.168	1.210	1.245	1.267	1.276	1.273	1.259	1.238	1.212	1.183	1.153	1.124	1.096	1.071
−30	1.068	1.053	1.043	1.038	1.037	1.040	1.049	1.069	1.097	1.133	1.172	1.208	1.238	1.258	1.266	1.263	1.251	1.232	1.209	1.184	1.159	1.133	1.109	1.087
−45	1.091	1.079	1.071	1.067	1.066	1.068	1.076	1.092	1.114	1.143	1.174	1.203	1.227	1.242	1.248	1.246	1.237	1.222	1.204	1.184	1.163	1.143	1.124	1.106
−60	1.116	1.108	1.102	1.099	1.099	1.101	1.106	1.117	1.132	1.152	1.174	1.194	1.210	1.221	1.226	1.224	1.217	1.207	1.194	1.181	1.166	1.152	1.139	1.127
−75	1.142	1.138	1.135	1.133	1.133	1.134	1.137	1.142	1.150	1.160	1.171	1.182	1.190	1.196	1.198	1.197	1.194	1.188	1.182	1.175	1.167	1.160	1.153	1.147
−90	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166	1.166

3.2.4 VARIATIONS WITH GEOMAGNETIC ACTIVITY.— The temperature variations with geomagnetic activity closely follow those of the 3-hourly geomagnetic planetary index, K_p or a_p, with a lag of 6 to 7 hours. The relation between exospheric temperature and planetary index, whether one chooses a_p or its nearly logarithmic counterpart K_p, seems to be nonlinear; it can be approximated by the two nearly equivalent formulas:

$$\Delta T = 28\, K_p + 0.03 \exp K_p \qquad (3.16)$$

or

$$\Delta T = a_p + 100\, [1 - \exp(-0.08\, a_p)]. \qquad (3.17)$$

Here ΔT is the increase of temperature above the level that applies for the condition $K_p = a_p = 0$. The time lag should not be forgotten in computing the temperature. Table 3.5 gives ΔT as a function of K_p, computed with the first of the two formulas, and at the same time shows the correspondence between K_p and a_p.

TABLE 3.5 TEMPERATURE INCREMENT AS A FUNCTION OF GEOMAGNETIC INDICES

K_p	a_p	ΔT	K_p	a_p	ΔT
0_0	0	0°	$5-$	39	134
$0+$	2	9	5_0	48	145
$1-$	3	19	$5+$	56	156
1_0	4	28	$6-$	67	167
$1+$	5	37	6_0	80	180
$2-$	6	47	$6+$	94	194
2_0	7	56	$7-$	111	210
$2+$	9	66	7_0	132	229
$3-$	12	75	$7+$	154	251
3_0	15	85	$8-$	179	279
$3+$	18	94	8_0	207	313
$4-$	22	104	$8+$	236	350
4_0	27	114	9	300	417
$4+$	32	124	9_0	400	495

There is no indication that $\Delta T/\Delta K_p$ varies with the hour of the day. There seems to be, however, a substantial increase in $\Delta T/\Delta K_p$ at latitudes above 50° or 60°, that is, in the auroral zones. Occasional increases by a factor of 2 to 4 have been observed, but it is not known whether such enhancements are regular or just occasional features at high latitudes. There is some indication that the time lag decreases a little at high latitudes. Jacchia et al. (1966) find a mean time lag of 7.2 ± 0.2 hours for latitudes lower than 55° and 5.8 ± 0.5 hours for latitudes higher than 55°. An even greater variation of the time lag with latitude was found by DeVries et al. (1966) from low-altitude Agena satellites in high-inclination orbits.

3.3 COMPUTATION OF EXOSPHERIC TEMPERATURE

Suppose, in accordance with the preceding formulas and present tables, atmospheric density is desired on September 15, 1963, at 1600 GMT, at an altitude of 420 km above sea level, for a point on the globe located at longitude 75° east of Greenwich and latitude 44° north.

The procedure is as follows: First, look up the daily mean of the 10.7-cm solar flux $F_{10.7}$ for the day in question, which in this case is 99×10^{-22} watts/m^2/cycle/sec. Second, determine the value of the flux averaged over three solar rotations, that is, over roughly 3 months. The monthly means of $F_{10.7}$ for August, September, and October, 1963, were 81, 85, and 85, respectively, in the same units as the foregoing. Therefore, to a close approximation, $\overline{F}_{10.7} = 84$. The needed value of the K_p index 7 hours earlier, that is at 0900 GMT, is found to be 4_0. The local solar time is 1105 hours, which corresponds to a solar angle $H^* = -14°$.

Summarizing, we have:

$F_{10.7} = 99$ Local Solar Time = 1105 hours

$\overline{F}_{10.7} = 84$ $\phi = 44°$.

$K_p = 4_0$

Variation with solar cycle. Equation (3.10) gives $T_0 = 362 + 3.60 \times 84 = 644.4$.

Variation with day-to-day solar activity. From Eq. (3.11) $T_0 = 644.4 + 1.8\,(99 - 84) = 691.4$

Semiannual variation. In Table 3.3 by interpolation, $f(d) = 0.257$; therefore

$$T_0 = 691.4 + 0.257 \times 84 = 713.0$$

Diurnal variation. By interpolation in Table 3.4, $T/T_0 = 1.205$; therefore,

$$T = 1.205 \times 713.0 = 859.2$$

Variation with geomagnetic activity. From Table 3.5, $\Delta T = 114°$; therefore

$$T_\infty = 859 + 114 = 973$$

Computations of density. T_∞ is the final exospheric temperature which is used to enter the appropriate seasonal density table for an altitude of 420 km. Look up the logarithm of the density, which is easier to interpolate, for the models corresponding to $T_\infty = 800°$, 900°, 1000°, and 1100° K, respectively, and form Table 3.6 complete with first and second differences.

By interpolation, for $T_\infty = 973°$ K, it is found that $\log \rho = -11.695$, from which $\rho = 2.02 \times 10^{-12}$ kg m^{-3}

TABLE 3.6.—DIFFERENCE TABLE FOR SAMPLE DENSITY COMPUTATION

	T_∞ (°K)	log ρ	Δ	Δ
For Z = 420 km	800	−12.118		
			+0.264	
	900	−11.854		−0.053
			+0.211	
	1000	−11.643		−0.040
			+0.171	
	1100	−11.472		

3.4 EXPERIMENTAL DATA

From the time of the earliest satellite drag studies the density values have been analyzed to determine if they vary systematically with latitude or season. From analysis of density values from 1957α, 1957β, 1958δ (Sputniks I, II, III) and 1958γ (Explorer III) Champion and Minzner (1959) found that in the 170 to 230 km altitude region, densities in the northern hemisphere winter were higher than those at low latitudes or at high latitudes in the summer.

Groves (1961) computed density data from orbital observations on ten Discoverer satellites during the period April, 1959 to October, 1960. He found, in general, that the change of density with latitude was less than 20 percent. However, in the altitude range 190 to 240 km, he found that the density was higher at latitudes above 30° in the winter than in the summer or at lower latitudes. The increase was as much as 60 percent near the pole in some cases. Some of these data are shown in Figure 3.8.

Lidov (1958) reported that latitude variations of density at 230 km may be as large as 50 percent. Priester et al. (1960) and Paetzold and Zschörner (1961) pointed out similar variations. Schilling and Whit-

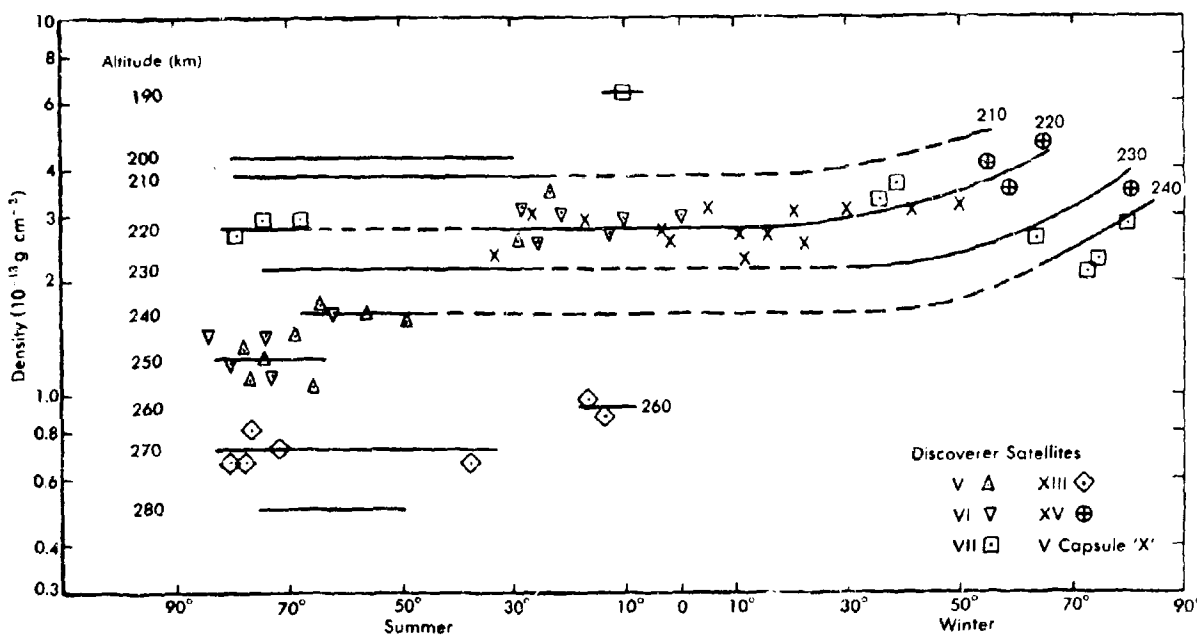


FIGURE 3.8.—Density versus latitude for polar regions (lat. > 65°) and night side of earth (L.T., 18–06 hrs) from Discoverer satellites, standardized to 20 cm solar flux of 160×10^{-22} watts/m^2/cycle/sec.

ney (1959) did not find any important latitude effect in densities derived from Explorer IV (1958ε) data. The perigee altitude was approximately 255 km and thus the result is consistent with the present models, which give no significant latitude variation at that altitude. Newton et al. (1965) found on analysis of Explorer XVII data for the latitude range 35° to 55° N. that any latitude variation of density at the satellite altitude (about 270 km) was less than a factor of 2.

Figure 3.9 shows some interesting satellite density data derived by Small (1964). The data for altitudes below 200 km are valuable because of the paucity of data in this altitude region. The data for 1962$\beta\sigma$ with perigee between 126 and 134 km are unique for a satellite. In the plot (Jacchia, 1965) the satellite data are divided into four groups: (1) exospheric temperature greater than 1200° K; (2) between 1000° and 1200° K; (3) less than 1000° K; and (4) from 1958δ2 (Sputnik III). The data from (4) were plotted separately because they may contain a systematic error. The figure represents departures in log density from that of the spring/fall model with an exospheric temperature of 1100° K. Curves are also shown for the winter and summer models with the same exospheric temperature. The data for 1962$\beta\sigma$ were obtained between 4 and 8 December 1962 with a perigee latitude of approximately 34° S. This corresponds to summer in the southern hemisphere and the agreement with the summer curve provides excellent confirmation of the models. At higher altitudes, the effect of varying exospheric temperature (with time of day, solar flux, and so forth) dominates over seasonal effects. For example, at 180 km the values of $\Delta \log \rho$ are marked on the plot corresponding to exospheric temperature extremes of 600° and 2100° K.

During the period of low solar flux, and consequently low exospheric temperature, it would be expected that appreciable diurnal density variations would be observed at relatively low altitudes. Figure 3.10 shows some interesting results obtained from observations of Cosmos satellites (Marov, 1966) which confirm this expectation. Perigee altitudes lay in the range 190 to 240 km. Note that the quantity $\rho\sqrt{H}$, where H is density scale height, is plotted, but the variation with time is primarily due to that in ρ. Maximum values occur near 1400 hours and minimum values near 0400 hours local time.

Roemer (1966) derived precise density data from Baker-Nunn observations of Explorer IX. Analysis of the data revealed a seasonal density variation of ±25 percent at a latitude of 39° and an average altitude of 690 km. The atmospheric density at a given altitude was higher in winter than in summer when compared with the model of the atmospheric bulge discussed in Section 3.2. He also found that the average time lag between the maximum of a geomagnetic storm and the peak in atmospheric density was 5.2 hours. In order to decide whether the variations of the residuals in log ρ represent a seasonal variation or whether they are caused by a smaller amplitude of the diurnal effect, the correlation coefficient between the residuals and the curves was computed. A correlation coefficient of 0.47 was obtained, compared with a coefficient of 0.22 when the correlation was made with angular distance from the bulge.

More recently, from a study of Explorer XIX and Explorer XXIV data, Jacchia and Slowey (1966) found that lower residuals can be obtained with a model in which there is no seasonal variation at high altitudes, and the bulge is always centered near the equator and elongated in the north-south direction ($m = 1.5$, $n = 2.5$). Keating and Prior (1966) have analyzed data from the same satellites (and also Explorer IX). Some of the results of their study are shown in Figure

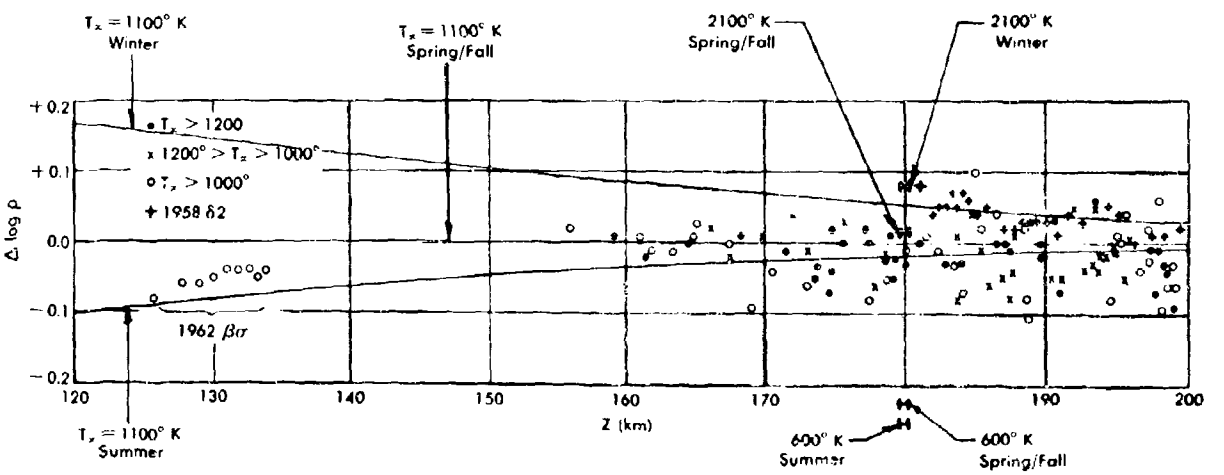


FIGURE 3.9.—Comparison of densities from drag of low-orbiting satellites with the present tables. Note that $\Delta \log \rho$ is the difference between $\log \rho$ for the experimental data and $\log \rho$ for the 1100° K exospheric temperature spring/fall model.

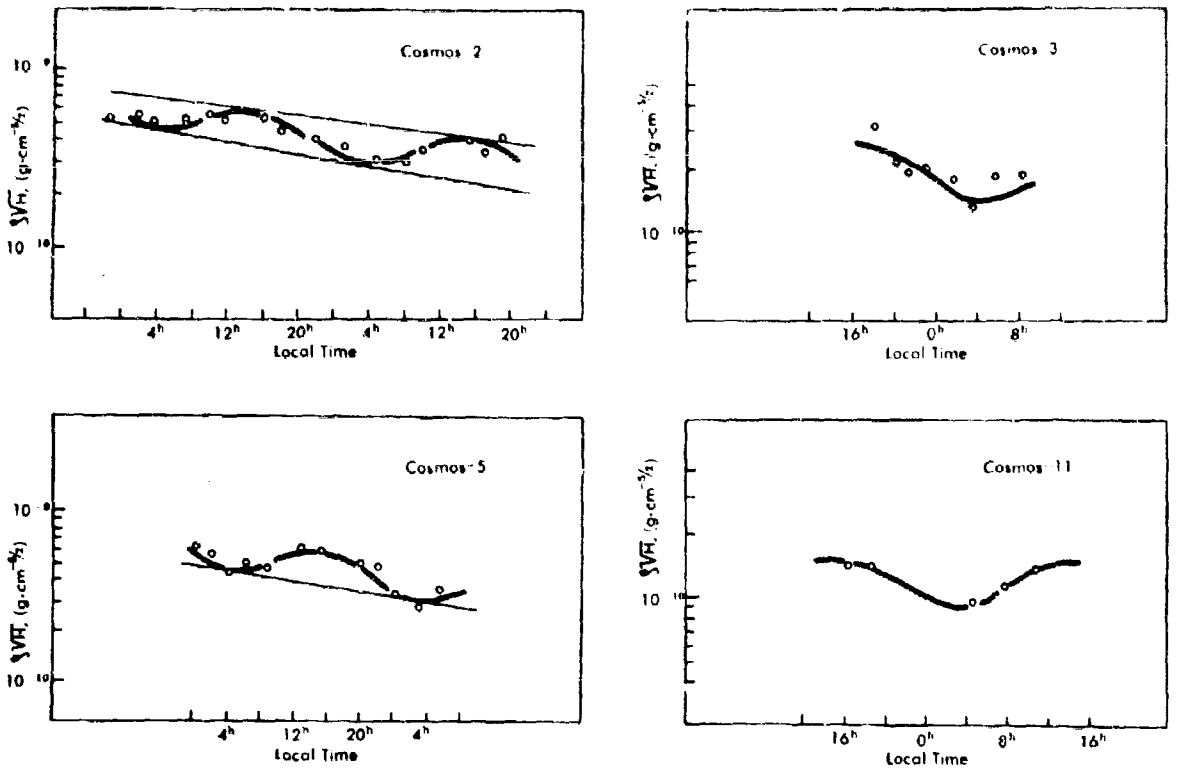


FIGURE 3.10.—Diurnal variations of $\rho\sqrt{H}$ at altitudes between 190 and 240 km from Cosmos satellites. The abscissa is local time.

3.11 where exospheric temperature residuals between predicted and observed values are plotted as a function of m and B; B is a constant defined by $\phi_B = B\delta_\odot$ so that negative B corresponds to a winter bulge. These results confirm that the new model of Jacchia and Slowey ($m = 1.5$, $B = 0$) gives smaller residuals than the earlier models ($m = 2.5$, $B = 1$), but indicate that the residuals are still lower with a model that has a density maximum in the winter hemisphere ($m = 1$, $B = -1$). However, the residuals are almost as low for a bulge centered at the equator ($m = 1$, $B = 0$). The density measurements which indicate a winter bulge were made with balloon-type satellites, within the altitude interval 550 to 850 km and between 1961 and 1966. Data from other satellites, altitudes and levels of solar activity must be analyzed before the position and shape of the bulge can be more accurately defined.

Some recent precision-reduced density data from ground-based observations of the San Marco satellite (Bramson, 1966) are given in Table 3.7.

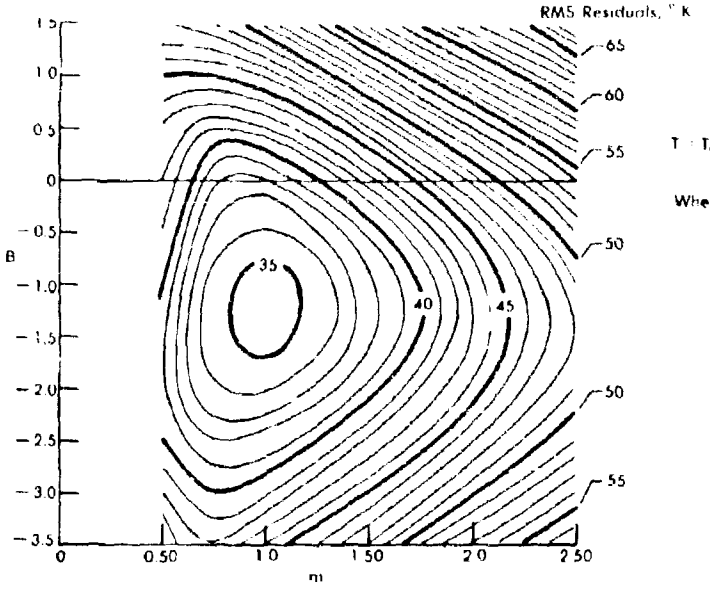
The data in the first line were obtained for a 1.5-day interval around 7 January 1965, and in the second line for a period of 12 hours on 9 September 1965. For 7 January 1965 the value of T_0 (minimum nighttime exospheric temperature) calculated from the present models is 652.5° K. From the satellite data $T_\pi = 772°$ K for a latitude $-34.3°$ and hour angle 103°. The

TABLE 3.7.—SAN MARCO SATELLITE DENSITY DATA

T_π	$\alpha_\pi - \alpha_\odot$	δ_π	Z	$\log \rho_\pi$	$\log \rho_s$
772° K	103.0	−34.3	210.2 km	−12.815	−12.654 (z = 200 km)
614	25.2	−31.5	172.3	−12.243	−12.190 (z = 170 km)

T_π = exospheric temperature at perigee
α_π, $\alpha_\odot$ = right ascension of perigee and sun, respectively
δ_π = declination of perigee
Z = perigee altitude
ρ_π, ρ_s = density at perigee and reference altitude, respectively, in g. cm^{-3}.

corresponding T_N (minimum nighttime exospheric temperature at the given latitude) was found to be 682.0° K and (with $m = 1.5$, $B = 0$) $T_0 = 652.6°$ K, which is in excellent agreement with the theoretical value. The value of T_π on 9 September was computed to be 614° K from a density of 6.46×10^{-19} kg m^{-3} at the perigee reference altitude. From these data T_N was calculated to be 505.8° K and $T_0 = 486.8°$ K. For this day the model predicts $T_0 = 671.6°$ K and $T = 812.2°$ K for a latitude of $-31.5°$ and an hour angle of 25.2°. This constitutes an apparently large discrepancy. However, the model density at 170 km corresponding



$$T = T_\infty(1 + 0.28\sin^m\theta)\left[1 + 0.28\left(\frac{\cos^m\eta}{1 + 0.28\sin^m\theta}\right)\cos^{2.5}\left(\frac{\tau}{2}\right)\right]$$

Where $\eta = \frac{1}{2}|(\delta_1 - 8\delta_2)|$

$\theta = \frac{1}{2}|(\delta_1 + 8\delta_2)|$

FIGURE 3.11.—Root mean square (rms) exospheric temperature residuals for Explorer XIX (1963-66) and Explorer XXIV (1964-66) as a function of B and m.

to $T = 812.2°$ K is 8.08×10^{-10} kg m^{-3}. The observed density is only 20 percent below this density, which is not a large discrepancy, particularly when considering the differences between some gauge and drag density data. The result primarily points out that exospheric temperature is not a good parameter with which to characterize atmospheric density below 200 km.

DeVries et al. (1966) have used multiple regression techniques to determine the functional dependence of atmospheric density. One interesting finding is that the delay time for the density increase following a geomagnetic storm varies with latitude, from near-instantaneous at 70° latitude to almost 22 hours for a satellite with perigee point near 20° latitude. Roemer (1966), on the other hand, found no variation of the delay time with latitudes up to 40°. Jacchia has raised the question whether in DeVries' study the density changes can be genuinely referred to the perigee location since the eccentricity of the orbits of the satellites studied was very small (0.013 to 0.027).

Several experimenters have made mass spectrometric measurements of neutral composition above 120 km. One of these is Schaefer (1966) who has analyzed the results of four composition measurements made with massenfilters. Two of the flights were at Churchill (1400 CST, 18 February 1965 and 0300 CST, 19 February 1965) and two were at Wallops Island (0300 EST, 28 March 1963 and 1300 EST, 26 November 1963). It should be noted that only the Churchill measurements constitute a genuine diurnal variation measurement. The data presented consist of ratios of the ion currents for the different species and not the density ratios. However, the variation of the two ratios with latitude, season, and time of day should be the same. The data clearly show that the O/O_2 ratio is larger during the daytime than at night and also larger at Wallops Island than at Churchill, as can be seen in Figure 3.12. Both observations are consistent with larger values of O/O_2 occurring when the solar EUV flux which causes the dissociation is larger. Observations are also consistent with the present models which show that the O/O_2 ratio is greater in the summer than in the winter.

Hedin et al. (1964) and Hedin and Nier (1965) have made a rather thorough analysis of the results obtained from a flight of a magnetic mass spectrometer at White Sands at 0730 MST on 6 June 1963. They give number densities of N_2, O_2, O, and Ar. The temperature profile, as determined by the slopes of the curves, is in satisfactory agreement with the CIRA 1965 models. However, the number densities of the various species are lower than the model values. When compared with the corresponding CIRA model the measured O_2 and O number densities are lower by a factor of 2.0, whereas the N_2 densities are lower by a factor of 1.7. When compared with the models in Part 6, the densities are found to be much closer at 120 km, but the discrepancy is greater at 200 km, as can be seen in Figure 3.13. At 120 km the ratios are 1.5 for O_2 and O and 1.1 for N_2; at 200 km the ratios are 3.4 for O_2, 2.5 for O, and 2.1 for N_2. Some of the discrepancy is probably due to calibration inaccuracies. There are three sources of this: (1) statistical errors ranging

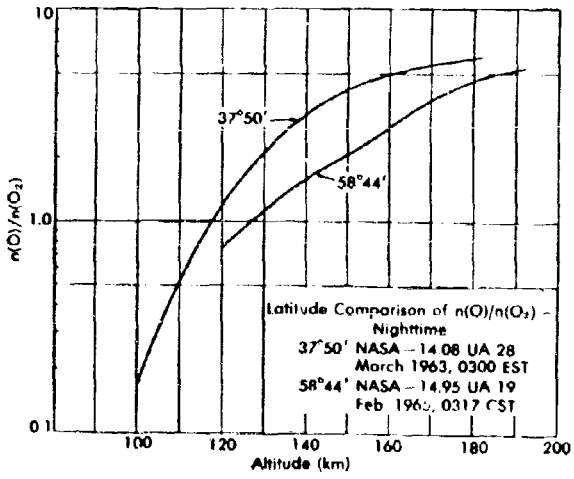


FIGURE 3.12.—Latitude variation of $n(O)/n(O_2)$ for nighttime measurements.

from 5 percent at the highest altitude to 30 percent at the lowest altitude for the N_2 profile and possibly higher for the other density curves; (2) an error of up to 50 percent in the laboratory calibration; (3) an error due to limitations of the theory used to relate the measurements made under dynamic conditions to the ambient density.

Some interesting density and temperature measurements have been made by Spencer et al. (1965). Results are available from six thermosphere probe flights in which the N_2 density was measured as a function of altitude with an omegatron gauge. Temperatures are deduced from the slopes of the N_2 profiles. The measurements were made at Wallops Island at various times of day and year between November 1962 and March 1965. In general, the densities are lower than the corresponding models by about a factor of 2. The temperature profiles from the four earlier flights are shown in Figure 3.14. They are in moderate agreement with the CIRA 1965 (Harris and Priester, 1964) model temperatures. For the two most recent flights the agreement of the temperature profile for the night measurement with both the CIRA and U.S. Supplementary models is satisfactory, but for the day measurement the agreement is much better with the U.S. Supplementary model. Spencer et al. (1965) conclude that "the assumption, for model atmosphere purposes, of constant boundary conditions at 120 km should be expanded to reflect, probably, a significant diurnal variation." The authors are in general agreement with this statement and had previously suggested the same conclusion with regard to latitude and seasonal variations (Champion, 1966). It is believed that there probably is also a diurnal variation of properties at 120 km, but the present data do not provide conclusive evidence as to its nature.

It should be noted that whereas the temperatures deduced by Spencer et al. (1965) tend to be low, those derived by Hedin et al. (1964) are higher than the supplementary models between 170 and 200 km and about the same as the models between 130 and 170 km.

Brandy (1964, 1965) has deduced rotational temperatures from the N_2^+ 3914 Å band emission during auroras at Churchill. Although there is a possibility that the rotational temperature may differ from the kinetic temperature, at least the altitude to be assigned to the measurement can be determined by means of the technique of triangulation. During the study over 800 measurements were made, which included 75 simultaneous altitude and temperature measurements. Data were obtained from auroras of intensity ranging from I to slightly over III. The observed rotational temperatures are plotted in Figure 3.15. Taking into account seasonal variations and the effects of solar flux and magnetic index, one notes the approximate expected temperature ranges from the tables in Parts 5 and 6, given as a function of altitude in Table 3.8.

TABLE 3.8.—TEMPERATURE RANGE AS A FUNCTION OF ALTITUDE

Altitude km	Temperature Range °K
80	171–224
100	190–218
120	334–380
140	467–574
160	550–671

Between 80 and 120 km, agreement between the experimental data and the models is reasonable, although the scatter of the experimental data is large. Probably the scatter is to be attributed primarily to disturbed atmospheric conditions that exist during aurora, but may also be partly attributed to differences between the rotational and kinetic temperatures. Above 140 km the observed temperatures are definitely lower than those of the models.

Bourdeau et al. (1964) have compared exospheric temperatures deduced from satellite drag observations with the intensity of extreme ultraviolet radiation measured by OSO–1. The EUV flux observed during the interval March to May 1962 is shown in Figure 3.16a. The plotted values represent the sum of the intensities of the twenty-two most prominent lines in the wavelength range 170 to 370 Å. Of course, these lines represent only a fraction of the *UV* up to 1750 Å which deposits energy in the atmosphere by either photo-dissociation or photo-ionization. In Figure 3.16b is plotted the exospheric temperature; in Figure 3.16c the 2800 Mc/sec solar flux; and in Figure 3.16d the geomagnetic index (ΣK_p). Superficially there appears to be good correlation between the EUV flux and the observed exospheric temperatures. How-

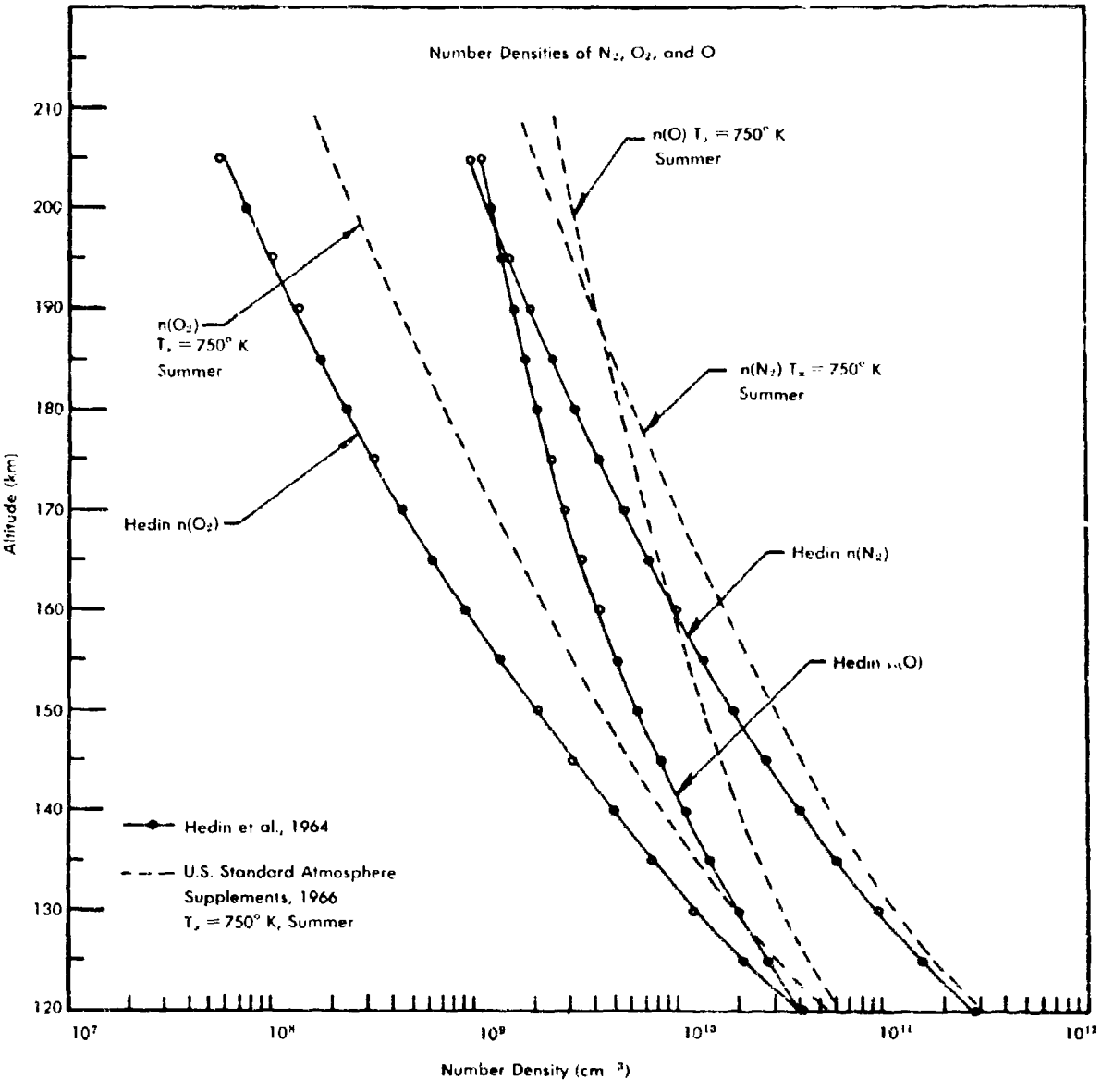


FIGURE 3.13. – Measured N_2, O_2, and O profiles at White Sands compared with values from the appropriate Supplementary model.

ever, the comparison is made for only a short period of time and much more observational evidence is required before conclusions can be made.

3.5 DENSITY DATA FOR ALTITUDES ABOVE 250 KILOMETERS

For altitudes greater than 250 km the observational material on which the present atmospheric models are based consists entirely of densities determined from the atmospheric drag on artificial satellites. Table 3.9 gives a list of the satellites that were used for drag analysis. The original density data up to the end of September 1963 have been published by Jacchia and Slowey (1965). No suitable satellites with perigee altitudes lower than 250 km were available for drag analysis in the construction of the original density models (Jacchia, 1964) on which the present models are based.

Checks on the models were provided by the yearly average daytime and nighttime density profiles determined from many artificial satellites by King-Hele and collaborators at the Royal Aircraft Establishment, Farnborough, England. See, for example, King-Hele and Quinn (1965).

3.5.1 COMPARISON OF MODELS WITH DENSITIES FROM SATELLITE DRAG. – In the homosphere and lower

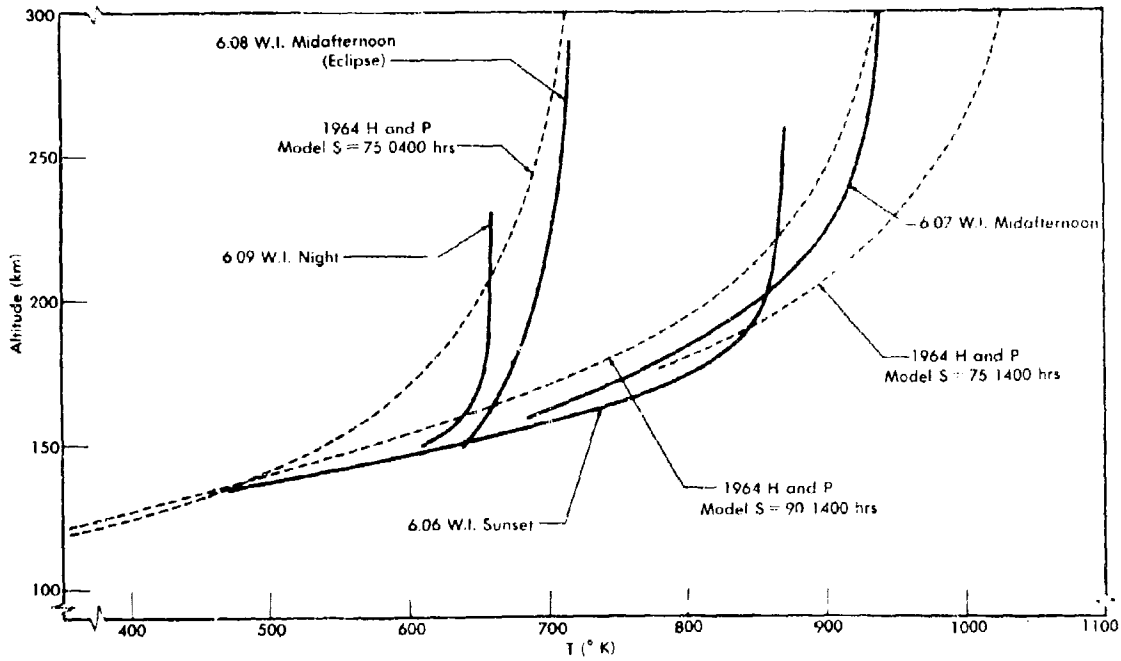


FIGURE 3.14.—N_2 temperature profiles measured with an omegatron compared with model atmosphere profiles.

TABLE 3.9.—SATELLITES USED FOR DETERMINING ATMOSPHERIC DENSITIES

Satellites	Perigee Altitude km	Apogee Altitude km	Inclination deg	A/m cm^2/g	Time Interval	Time resolution (days) of density determinations	
						Quiet Conditions	Magnetic Storms
*San Marco (1964-84A)	200	890	37.6	0.032	Dec 1964–Feb 1965	0.5	0.2
Injun III (1962βr2)	250	2500	70.3	0.070	Dec 1962–Aug 1965	1.0	0.2
Explorer XVII (1963d1)	270	800	57.6	0.036	Apr 1963–Oct 1963	1.0	0.2
Explorer I (1958α)	350	2000	33.2	0.17	Feb 1958–Aug 1965	1.0	0.2–0.5
Explorer VIII (1960ζ1)	425	2250	50.0	0.11	Nov 1960–Aug 1965	2.0	0.5
Vanguard III (1959η)	515	3720	33.3	0.17	Sept 1959–Sept 1962	2.0	0.5
*Explorer XXIV (1964-76A)	545	2400	81.4	12.2	Nov 1964–Aug 1965	1.0	0.5
Vanguard II (1959α1)	565	3300	32.9	0.24	Feb 1959 Aug 1965	2.5–5.0	1.0
*Explorer XIX (1963-53A)	615	2400	78.6	13.0	Dec 1963–Aug 1965	1.0–2.0	0.5
Vanguard I (1958β2)	660	3950	34.2	0.25	May 1958 Oct 1961	2.5–5.0	1.0
Explorer IX (1961δ1)	450–760	2500	38.9	15.8	Feb 1961 Sept 1963	0.5	0.2

*The satellites marked with an asterisk were launched too late to be used in the construction of the density models. They did, however, provide a further check on them and help to improve the model of the diurnal variation.

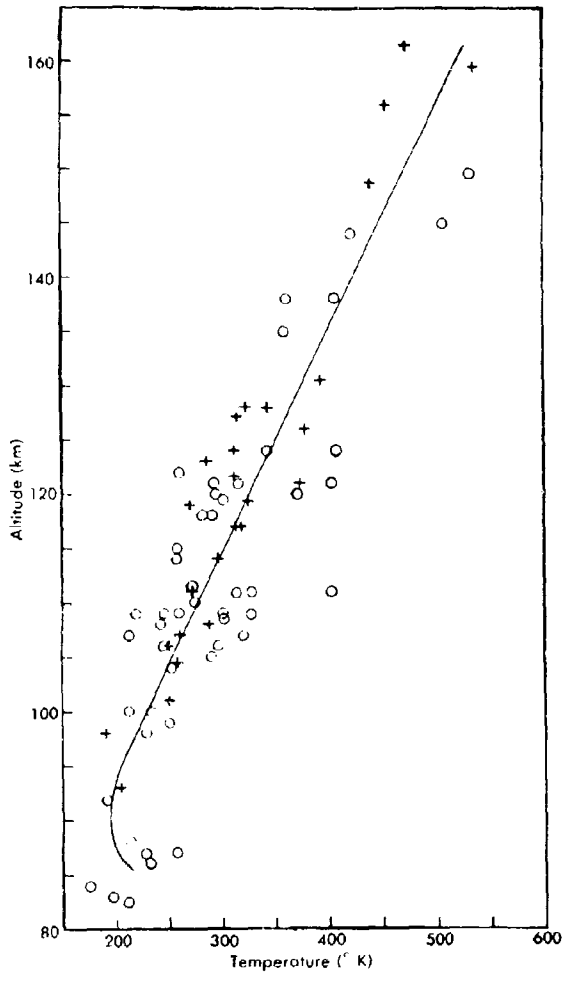


FIGURE 3.15. – Rotational temperature versus altitude at Churchill. Data for 1964 and 1965.

thermosphere, at altitudes below 150 km, density variations are relatively small, hardly ever exceeding a factor of 3. At greater altitudes, however, density variations rapidly increase, reaching a factor of 12 at 300 km, of 50 at 400 km, of 150 at 500 km, and a maximum of 200 or more near 600 km. In consideration of the magnitude of these variations, the systematic and even the random residuals obtained when comparing density observations with the present models are surprisingly small.

A typical example of the density errors that can be expected when the models are used with computed values of T_x is given in Table 3.10. This table lists mean deviations from the tables of Part 6, standard deviations for individual density determinations made at 2-day intervals and the standard deviations of the 10-day mean densities, all for 4 separate years of observations of the Explorer VIII satellite (1960ξ1). The deviations include the systematic and accidental errors in the determinations of the densities.

TABLE 3.10. – DEPARTURES FROM THE MODELS OF EXPLORER VIII DRAG DENSITIES

Time Interval	Mean Deviation %	SD of One Density Value %	SD of 10-Day Means %
Nov 1960–Oct 1961	+6	28	23
Nov 1961–Oct 1962	−3	22	17
Nov 1962–Oct 1963	−14	32	26
Nov 1963–Oct 1964	−15	30	26

The systematic trend in the mean deviation is attributable in part to imperfections in the relation between T_x and $F_{10.7}$, and in part to the failure of the tables to represent exactly the variation of density with T_x at the perigee altitude of the satellite (425 km).

Error statistics are not available for all satellites that have contributed data for the construction of these models. We can, however, give a few additional statistics. Ten-day density means from the drag of the Explorer I satellite (average perigee altitude 350 km), covering the 7½ years from February 1958 to October 1965, when converted to temperatures with the present models, are represented with a mean residual of −18° and an arithmetic mean of the residuals, irrespective of sign, of 44°. If we assume that the mean exospheric temperature during this interval was about 1000° K, the corresponding mean residual in log ρ would be −0.027, or about −6.5 percent in ρ; the mean of the absolute values of the individual residuals would turn out to be 0.066 in log ρ, or about 15 percent in ρ. A similar analysis for Explorer XXIV, with an average perigee altitude of 545 km gives for 10-day means, from November 1964 to August 1965, a mean residual of 3.6° (corresponding to −3 percent in density), and a mean absolute value of the residuals of 19.7° (17 percent in density).

Densities and temperatures derived from the drag of the Explorer I satellite (1958α) are compared in Figure 3.17 with solar and geomagnetic parameters. The decrease in density and temperature parallels the decrease in the 10.7-cm solar flux during the five-year period covered by the diagram. The regular oscillations with a period of about 250 days are caused by the motion of the satellite perigee in and out of the diurnal bulge. Visible also are the 27-day oscillations, in phase with those of the 10.7-cm solar flux, and a few perturbations caused by major magnetic storms. Schematic curves of the diurnal and semiannual variations are added to aid in their recognition in the plots of satellite data. The short period oscillations in the theoretical diurnal-variation curve are caused by the rapid variations in latitude of the satellite perigee.

Densities and temperatures derived from the drag of the Explorer IX satellite (1961δ1) are compared with the geomagnetic index a_p and the 10.7-cm solar flux (Figure 3.18). The drag was determined from

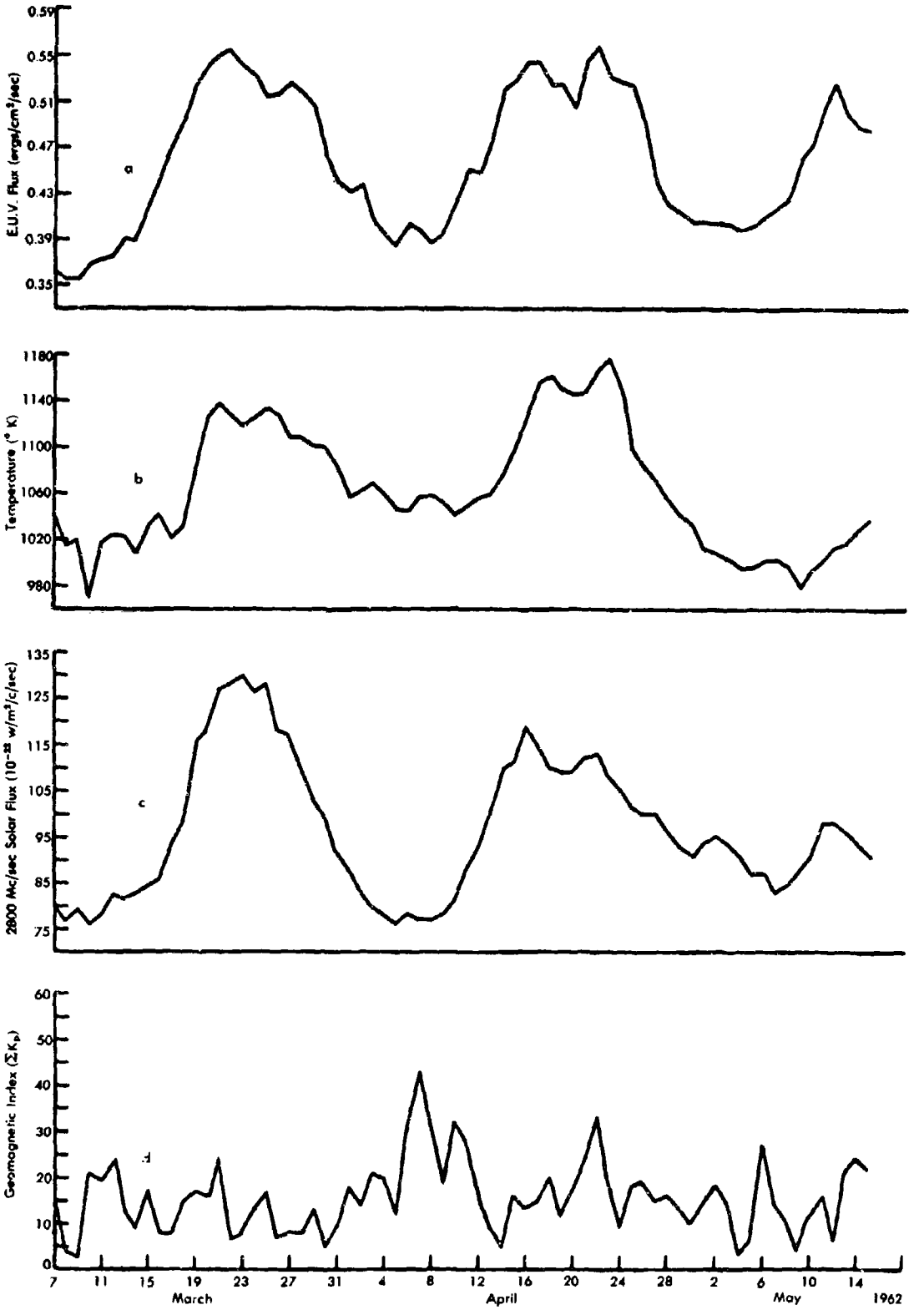


FIGURE 3.16.—Comparison of the EUV flux with the exospheric temperature, the 2800 Mc/sec solar flux, and the geomagnetic index ΣK_p.

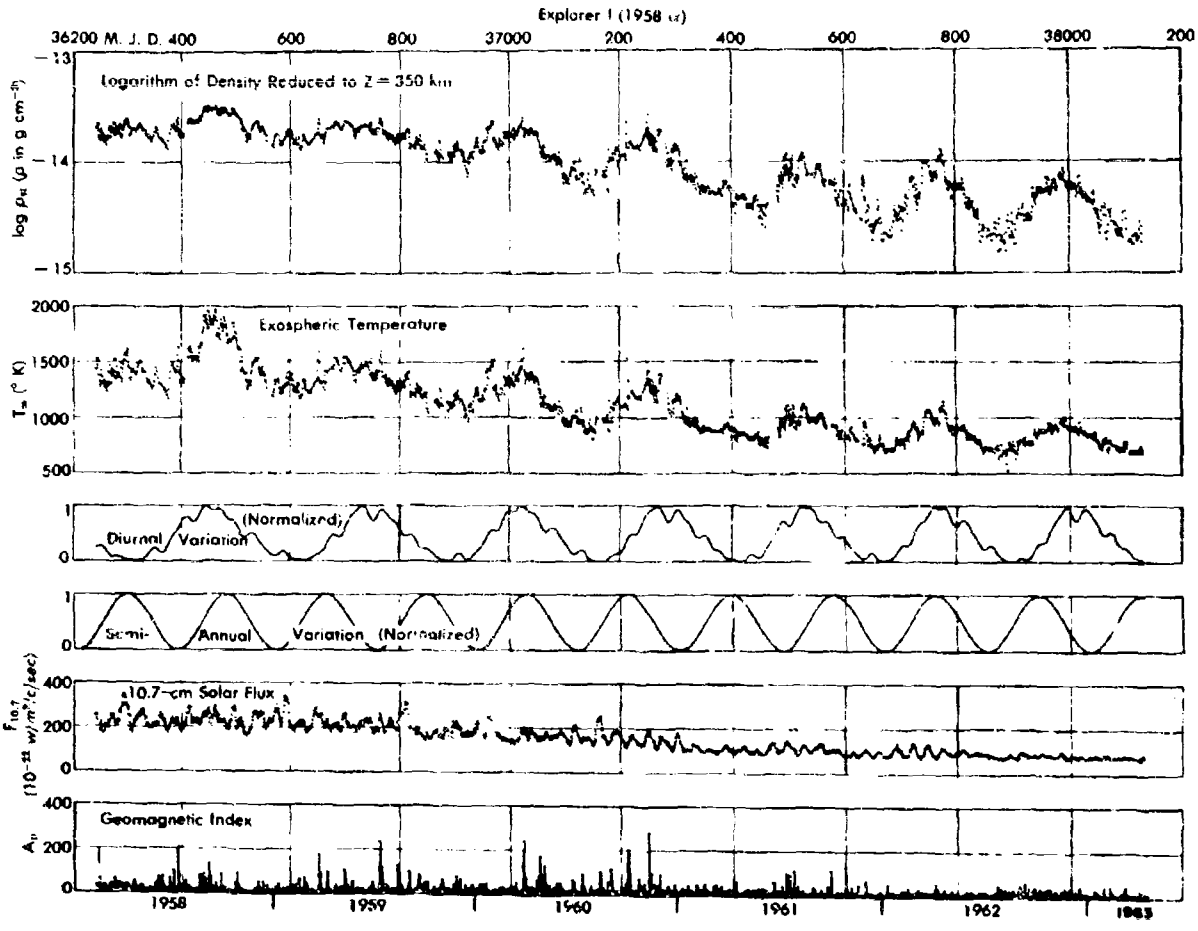


FIGURE 3.17. — Densities and temperatures derived from the drag of the Explorer I satellite (1958α), compared with solar and geomagnetic parameters. MJD is the abscissa in the Modified Julian Day (JD minus 2400000.5).

precise position measurements on photographs taken with the Baker-Nunn cameras. Notice the 27-day oscillations in phase with the 10.7-cm flux and the perturbations in phase with geomagnetic disturbances. Day and night density profiles in the upper atmosphere corresponding to extreme conditions at sunspot minimum and at a time of exceptionally high solar activity are shown in Figure 3.19.

Daytime maximum and nighttime minimum temperatures above the thermopause deduced from density data are shown in Figure 3.20 as a function of the 10.7-cm solar flux. Data are averaged over two or three solar rotations. Open circles denote individual maxima deduced from satellite drag curves. Dots indicate temperatures reduced to the nighttime minimum at times when the curve of the semiannual temperature variation was close to the annual average. The temperatures in this diagram must be considered as referred to average quiet geomagnetic conditions ($K_p = 2$ or $a_p = 7$).

3.5.2 DIRECT MEASUREMENTS OF DENSITY. — A number of satellites have been instrumented with pressure gauges, mass spectrometers or accelerometers. Each of these instruments can provide an instantaneous measurement of density, independent of that deduced from orbital observations of a satellite. The instrumented satellites include San Marco (accelerometer), Snapshot (ionization gauge) and Explorer XVII (gauges and mass spectrometers). Figure 3.21 contains data obtained from Explorer XVII (Newton et al., 1965) between April and June 1963 during passes over the northern hemisphere mid-latitude minitrack stations, and plotted without regard for local time, geomagnetic or solar activity. Due to orbit characteristics, the local times of the data for altitudes above 400 km are usually between 0 and 0600 hours. The data below 400 km are more generally distributed throughout the day. The comparison models in Figure 3.21 are from Harris and Priester (1962). The Supplementary Atmosphere model with exospheric temperature 650°K (corresponding to $\bar{F} = 82$, $K_p = 0$) is almost identical with Harris and Priester ($S = 90$, 0400 hours). If $K_p = 2$ (a more typical value) the exospheric temperature is 700°K and the

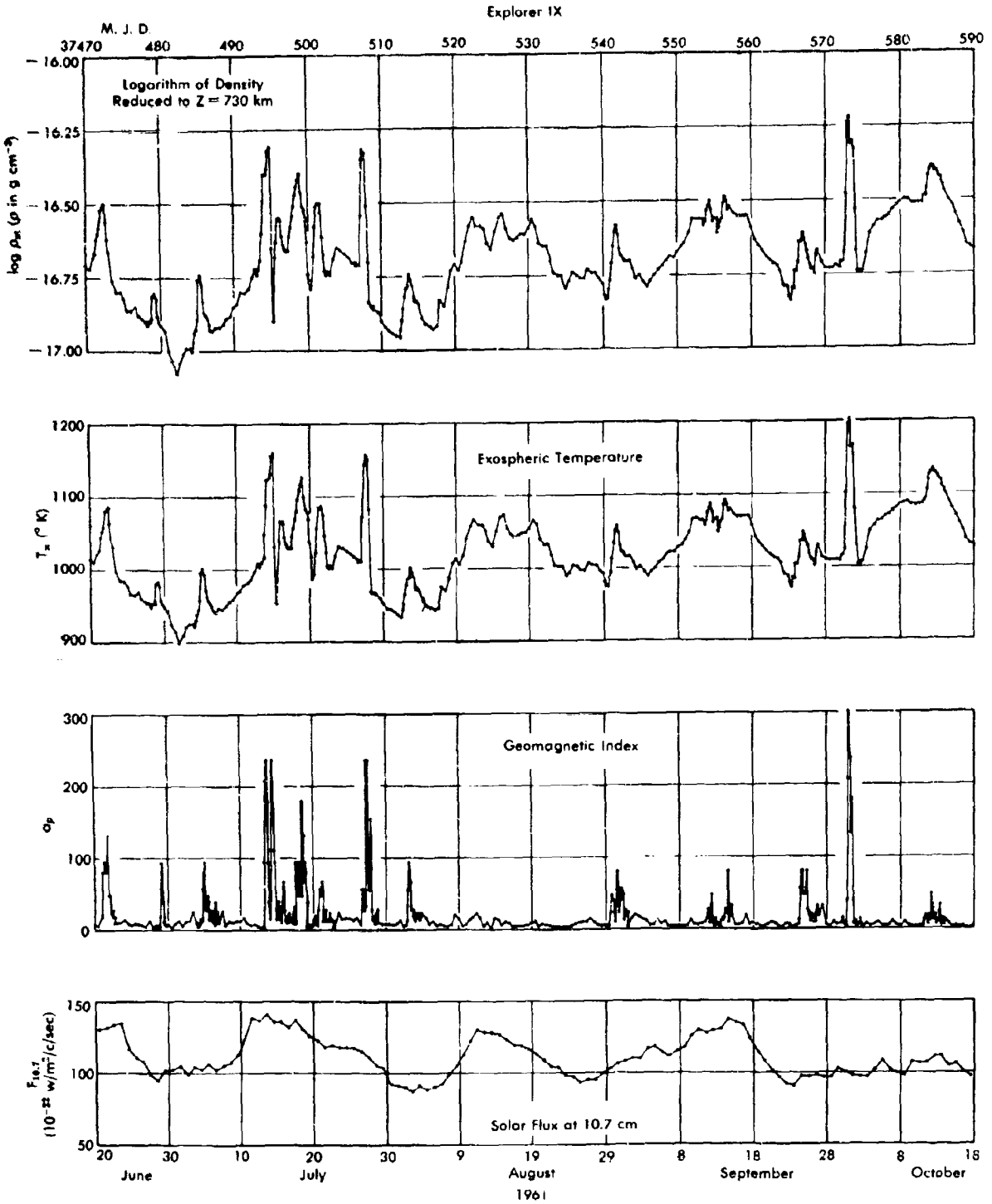


FIGURE 3.18. – Densities and temperatures derived from the drag of the Explorer IX satellite (1961δ1), compared with the geomagnetic index a_p and the 10.7-cm solar flux.

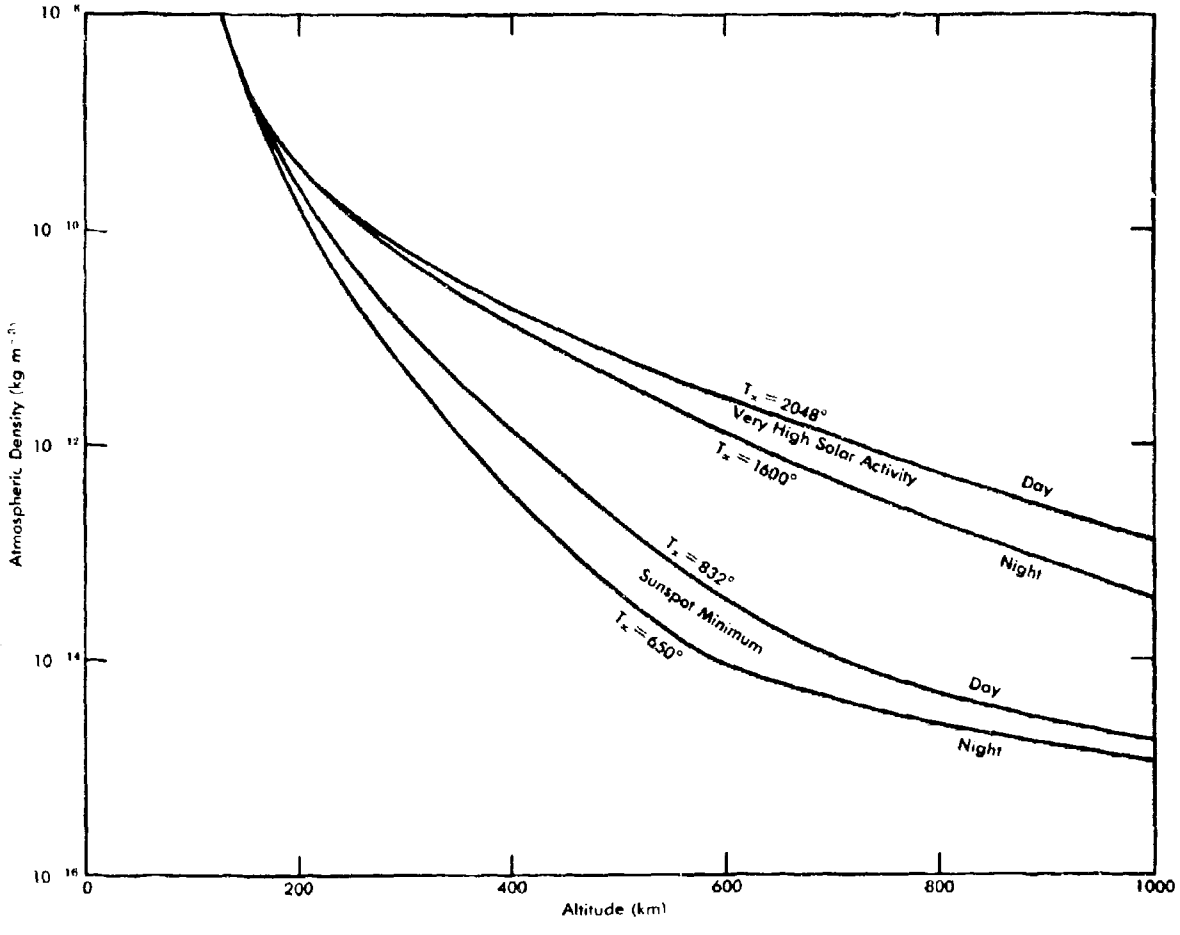


FIGURE 3.19.—Day and night density profiles in the upper atmosphere at sunspot minimum and at a time of exceptionally high solar activity.

density curve is a little higher than the Harris and Priester 0400 hours curve.

There is evidence in the data of density fluctuations which do not correlate with any known index. For example, a density variation occurring on 1 June 1963 correlates with an increased zenith intensity of the 6300 Å oxygen line. It might be that these fluctuations reflect local perturbations with horizontal dimensions of the order of a few thousand kilometers. The implication of these variations is that caution should be exercised in interpreting results obtained by combining directly measured parameters with model atmospheric values.

Explorer XVII contained magnetic mass spectrometers to obtain data on the concentrations of the major neutral atmospheric components (Reber and Nicolet, 1965). Densities of N_2, O, and He were obtained. Figure 3.22 is representative of the results and shows helium number densities plotted versus altitude for local times between 0400 and 2100 hours. These measurements were made in both northern and southern hemispheres during the last two weeks in May 1963. A diffusive model profile for $T = 800°$ K (reduced in absolute value by 3) is shown for reference. (The exospheric temperature from the models for the time of the measurements was approximately 700° K and the theoretical curve for this temperature is in much better agreement with the data.)

An unexpected result of the observations was the large variability of the absolute concentrations and ratios of concentrations of the components measured at the same altitudes and local times (and with the same measuring equipment) on successive days. There is a strong sensitivity to changes in magnetic activity. Some of the variations cannot be explained entirely on the basis of temperature changes in the upper atmosphere, but must be attributed to changes in the boundary conditions at the base of the diffusive atmosphere. Further investigations are clearly required in order to define the source of these variations and their relation to the various energy inputs to the atmosphere.

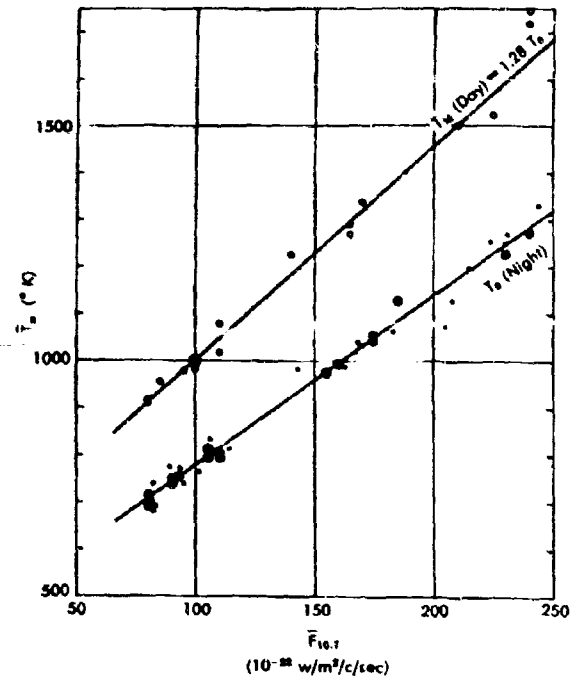


FIGURE 3.20.—Daytime maximum and nighttime minimum temperatures above the thermopause as a function of the 10.7-cm solar flux. Open circles: individual maxima deduced from satellite drag curves. Circled dots: individual minima deduced from satellite drag curves. Dots: temperatures reduced to the nighttime minimum at times when the curve of the semiannual temperature variation was close to the annual average.

3.6 LIMITATIONS OF HIGH-ALTITUDE MODELS

Simple static models cannot represent to complete satisfaction the properties of the upper atmosphere through all its manifold variations. Even if they were perfect, static models would represent only idealized equilibrium conditions that are never realized owing to the perpetual presence of rapid temperature fluctuations, such as the diurnal variation and variation associated with geomagnetic activity. If the temperature variation necessary to produce a given density change at a given altitude is correct when the variation is caused by changes in solar activity in the 11-year cycle, then it cannot be correct when the same change in density is caused by the diurnal variation. This does not mean that we cannot reproduce, and even with good approximation, the diurnal variation in density; we can, but to obtain the observed density change we shall have to use a fictitious temperature variation that may be at some variance with reality. The equations in Section 3.2 that relate T_∞ to local solar time and to K_p or a_p must be considered in this light; the aim was to reproduce the observed density variations, and we cannot guarantee that the corresponding temperature variations are correct.

In addition, we must consider the fact that, owing to the many oversimplifications one is obliged to introduce for construction of any atmospheric model, our models cannot be expected to reproduce to complete satisfaction even idealized static conditions. One of the most serious oversimplifications is certainly that of the invariance (except for seasonal variation) of the boundary conditions at 120 km through all the variations at greater altitudes, an assumption forced on us by lack of information. By systematically changing these boundary conditions with T_∞, we could find different sets of temperature profiles that would reproduce the observed densities with comparable accuracy. Stein and Walker (1964) estimate that the present state of our knowledge concerning the lower thermosphere allows such a leeway that all exospheric temperatures could be in error by as much as 25 percent.

One of the consequences of the arbitrary isopycnic layer at 120 km is the emergence in the models of a quasi-isopycnic layer, which at times of low solar activity lies at 150 km, but rises to 200 km at times of high solar activity. In the region between 120 km and the second quasi-isopycnic layer, the variations in density with temperature are inverted with respect to those above it, that is, an increase in temperature engenders a decrease in density. We know that this is not so, at least for two types of variation. In 1957 and 1958, near sunspot maximum, the drag of Sputnik II (perigee height 200 to 210 km) showed lively fluctuations in phase with the decimetric solar flux, although according to the models there should not have been any; and in 1963 and 1964 (sunspot minimum) marked variations with geomagnetic activity were observed, in phase with those in the exosphere, at heights as low as 160 km.

The difficulties due to the arbitrary isopycnic level at 120 km are partially relieved by having three sets of boundary conditions at that altitude. This makes it possible to represent typical seasonal variations in properties at 120 km and higher altitudes. The same technique can be used to represent changes with time of day, solar flux, and magnetic index when these variations are known.

It should also be kept in mind that the mechanisms that cause the different types of atmospheric variation may involve energy dissipation at different altitude levels, and that this can be another source of distortion of the temperature profiles.

It must also be remembered that the relation between exospheric temperature and solar activity was derived from only the descending half of one solar cycle, which happened to be the most spectacular of all cycles observed since 1749. If the relation holds without change throughout a cycle and from one cycle to another, the exceptional nature of the last cycle may prove to have been a boon, inasmuch as it allowed the models to cover the largest possible range of density variation. Nevertheless, we cannot discount

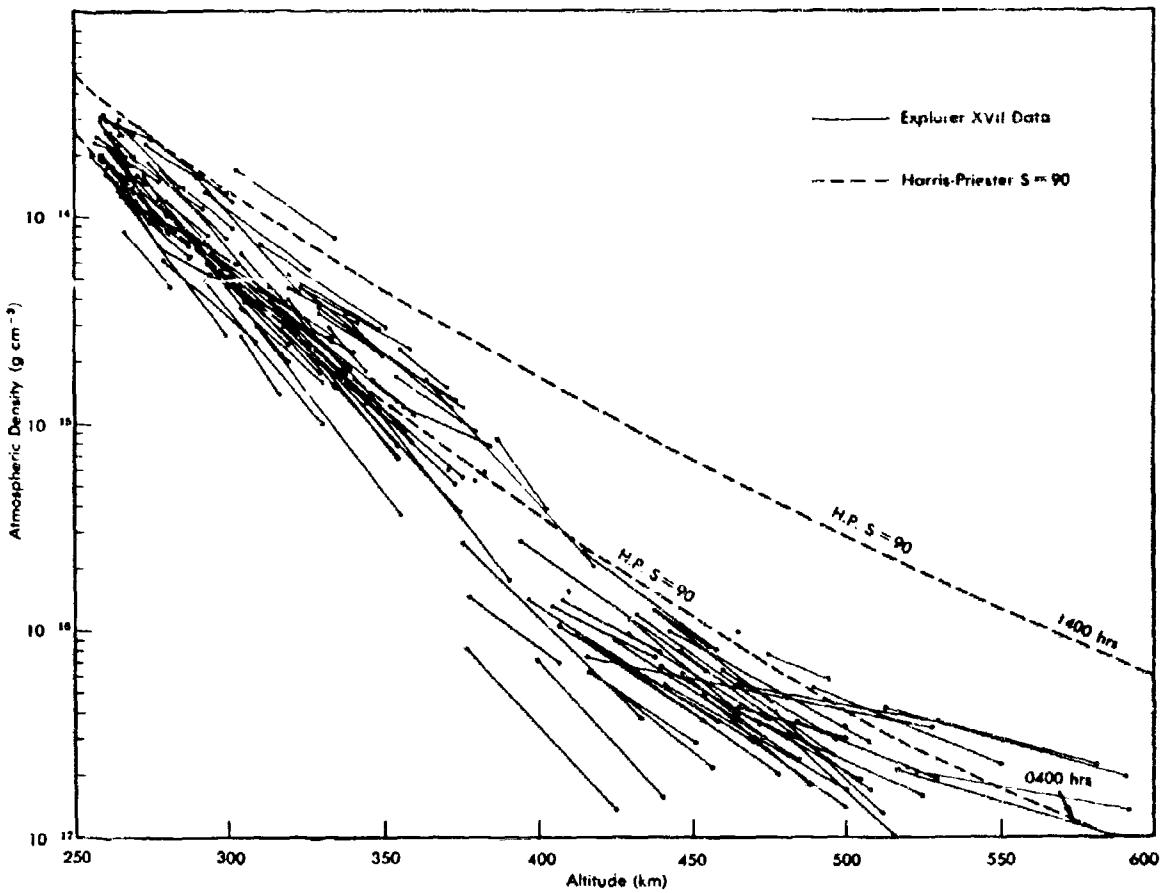


FIGURE 3.21.—Measured atmospheric density versus altitude obtained for passes over the northern hemisphere mid-latitude minitrack stations. Data plotted without regard for local time, geomagnetic or solar activity.

the possibility, however unlikely, that the relation between atmospheric temperature and solar activity may not be maintained during a period of increasing sunspot activity.

We must not forget the possibility of a systematic error in the density tables caused by our imperfect knowledge of the drag coefficient of satellites. Atmospheric densities are generally determined assuming a constant value, $C_D = 2.2$. In a recent paper on satellite drag coefficients, Cook (1966) concluded: "Between heights of 140 and 400 km at times of low solar activity, or heights of 140 to 600 km at times of high solar activity, the drag coefficient is almost independent of height, and at present for most satellites, because of the lack of decisive evidence, there is perhaps not sufficient reason to abandon the value of 2.2, which has been widely used in recent years for the drag coefficient. It must be recognized, however, that this value is subject to some uncertainties and may be too low, perhaps by as much as 10 percent. At heights above 400 km (low solar activity) or 600 km (high solar activity) the drag coefficient increases with height."

According to Cook, the drag coefficient C_D should increase to an asymptotic value of 2.6 to 2.7, which is nearly reached at 800 km at times of low solar activity. The relative uncertainty in C_D, however, should not increase with altitude; the likely error is estimated at 15 percent, while the maximum possible error is about 30 percent.

Since a density value computed from satellite drag is inversely proportional to the assumed value of C_D, we must count on similar uncertainties from this cause in the model densities below 600 km at times of high solar activity, and below 400 km at times of low solar activity. Above these levels there is the likelihood of a systematic error, increasing with altitude, that will make the computed densities a little too high, on account of the assumed constancy of C_D.

There has been much discussion about the discrepancy between the densities derived from satellite drag and those computed from the output of density

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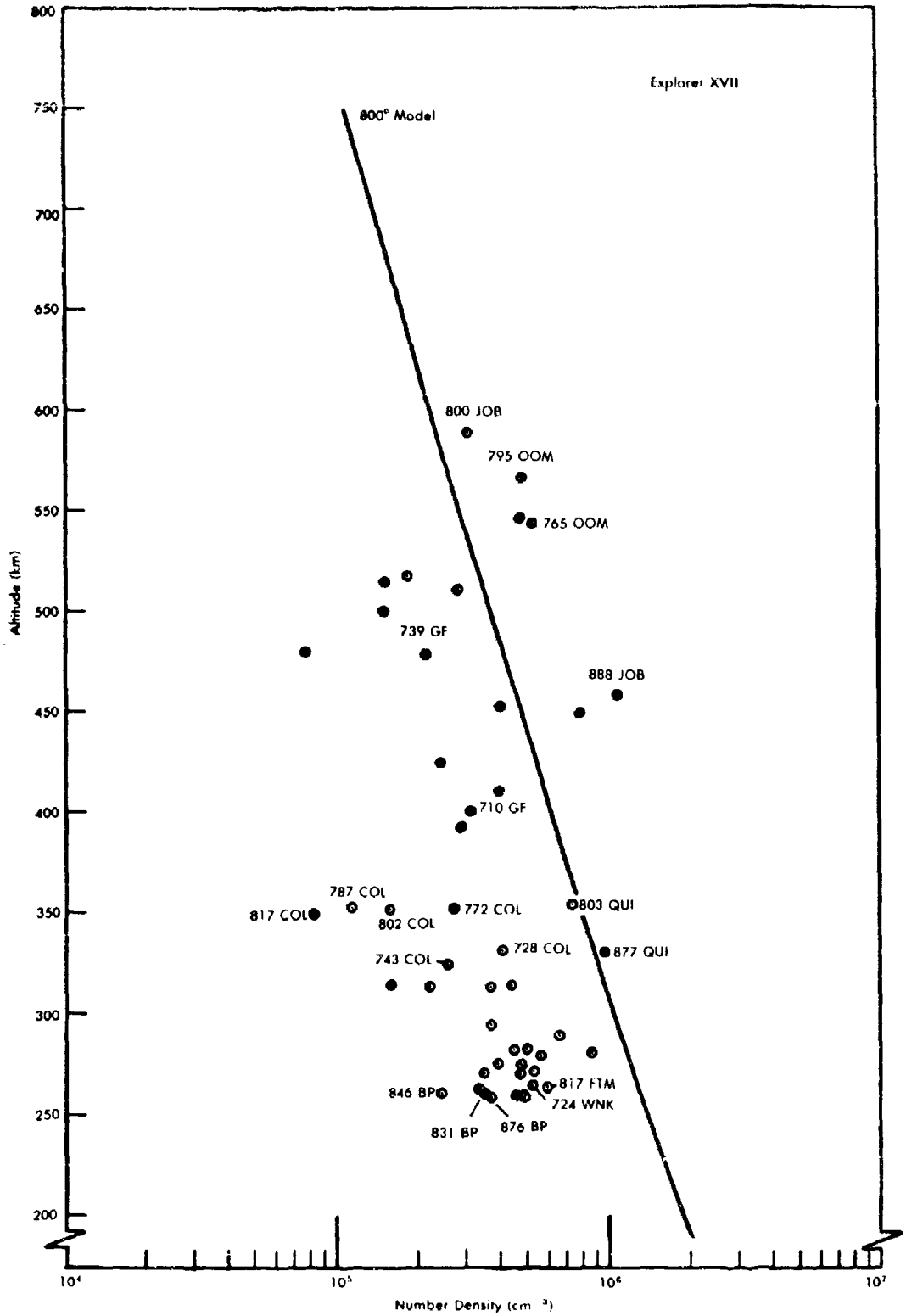

FIGURE 3.22.—Helium number densities versus altitude for local times between 0400 and 2100 hours during May, 1963. A diffusive model profile for $T = 800°$ K (reduced in absolute value by three) is shown for reference.

gauges on the Explorer XVII satellite (Newton et al., 1964), which appear to be about half the former. It is the opinion of Cook (1965) that the uncertainty in the drag coefficient, the primary physical parameter for which some assumptions have to be made in the drag method, is too small to explain the discrepancy.

A word of caution about hydrogen is necessary. At times of high and even moderate solar activity the contribution of hydrogen to the total density is negligible for altitudes up to 1000 km. The situation is quite different at times of low solar activity. In the model corresponding to an exospheric temperature of 700° K, the number density of hydrogen overtakes that of helium at 900 km, whereas in the model for 600° K the crossover point is down to 510 km. Hydrogen is the only constituent for which the densities given in the model rely entirely on theory, and moreover it is the only constituent for which the total mass in the atmosphere should vary greatly with exospheric temperature, because of the effect of the latter on the escape rate.

In addition to the uncertainties that obviously exist in the theory, we must warn the reader that Eq. (3.3), which fixes the boundary conditions for hydrogen at 500 km, was fitted to Kockarts and Nicolet's (1962, 1963) theoretical hydrogen concentrations, which had been computed for temperatures between 2000 and 750° K. Thus, below 750° K the results from Eq. (3.3) represent an extrapolation. According to the models, in the region above 840 km there is an actual *increase* of density when the exospheric temperature drops from 700° to 600° K. Recent results from the Explorer XIX satellite (Jacchia and Slowey, 1966) indicate that the hydrogen concentrations given by the models for temperatures below 700° K are too high, so that it appears doubtful that the inversion of the covariance of density with temperature in the exosphere occurs in the real atmosphere within the tabular range of temperatures and altitudes. A useful rule is to distrust model densities when hydrogen is the major constituent. Only the models for 600° K and 700° K are affected; the first above 500 km and the second above 800 km.

The uncertainty concerning hydrogen is one of many that are encountered in the exosphere. There are disquieting signs that our models of atmospheric variations, derived from satellites with perigee altitudes mostly below 500 km, cannot be trusted at much greater altitudes. For example, Cook (1966) finds from the drag of Echo II during 1964 and 1965 that at an altitude of 1100 km there is little evidence for a seasonal variation. On the other hand, the semiannual variation, with a range of a factor of 3 in the densities, emerges as the only significant fluctuation at that altitude. The ion density in the $F2$ layer, as evidenced by observations of the critical frequency f_0F2, shows a large semiannual oscillation in phase with the density variations of the neutral atmosphere (Radicella and Cosio de Ragone, 1966). This lends support to the view expressed by King and Kohl (1965) and by Jacchia and Slowey (1966) that there might be a causal relation between ion density and neutral-gas temperature in the diurnal variation.

Ions propelled by electric forces in the geomagnetic field (Martyn, 1966) may be responsible for the 100 m sec^{-1} mass transport of the neutral atmosphere in an easterly direction, at altitudes between 200 and 300 km, deduced by King-Hele and Scott (1966) from the secular variations in the orbital inclinations of satellites. Winds of this magnitude are bound to affect the global distribution of temperatures at thermospheric levels. At greater altitudes, where ions are free to move with little chance of collisions, we can expect the penetration of ions, driven along magnetic lines of force through the neutral atmosphere, to distort the density distribution computed according to the laws of diffusion. Under these conditions, the departure from hydrostatic equilibrium can also be expected to become a serious factor. The altitude at which the mean free path of a neutral particle is equal to the atmospheric scale height is about 900 km when the exospheric temperature is 2000° K, but it drops to 500 km for 1000° K and to 350 km for 600° K. At sunspot minimum, therefore, exospheric conditions prevail at altitudes as low as 350 to 400 km.

PART 4

Additional Information Relating to the Atmosphere

PART 4

Additional Information Relating to the Atmosphere

4.0 INTRODUCTION

During the period covering COESA's development of the major contributions of this publication, the supplementary tables of the atmosphere of Parts 5 and 6, the need for some related material has been recognized. This need includes mathematical expressions that can be used to approximate the detailed profiles of pressure and density of the 1962 Standard to 200 km and these 1966 Supplements to 80 km; ozone distribution to 50 km, and altitude-latitude relationships for locating at the correct geometric altitude the atmospheric data in the tables of Part 6 which are presented only for standard latitude.

4.1 ANALYTIC APPROXIMATIONS OF ATMOSPHERIC PRESSURE AND DENSITY

4.1.1 U.S. STANDARD ATMOSPHERE, 1962.—The basis for the *U.S. Standard Atmosphere, 1962* was the selected variation of molecular-scale temperature with altitude.* The selected profile had a number of corners, that is, discontinuities in the lapse rate or first derivative. For those applications in which such discontinuities induce computational or other difficulties, approximate smoothed versions of the standard atmosphere were developed and presented in Part II.3 of the 1962 Standard. The standard molecular-scale temperature profile was approximated, in various degrees, by polynomial functions of geometric altitude from 0 to 200 km. The polynomials of degrees eight and ten were used to obtain approximations for the pressure and density which were mutually consistent with respect to the hydrostatic equation and perfect gas law.

For some applications it is preferable to have direct, simple approximations for the 1962 Standard pressure and density, as functions of geometric altitude, even though these may not be exactly compatible with respect to the hydrostatic equation. This will be especially true, for example, of an application in which the density profile is the basic requirement of all the atmospheric properties.

In what follows, the aforementioned direct approximations for pressure and density are developed. Although this problem is not so restricted as to have a unique solution, the outstanding feature to be observed is that both pressure and density roughly are exponentially decreasing functions of altitude. Equivalently, the logarithms of both pressure and density roughly are linearly decreasing functions of altitude. This feature primarily influenced the two approaches taken to the solution of the approximation problem.

The first solution presented here is a generalization of a method used in digital computers for generating the exponential function. The variable $f(Z)$ to be represented is expressed approximately:

$$f(Z) = 1/(A_0 + A_1 Z + A_2 Z^2 + \ldots + A_n Z^n)^4 \quad (4.1)$$

on a certain interval $Z_0 \leq Z \leq Z_1$. In the present case, the independent variable Z is the geometric altitude, $Z_0 = 0$ is the lower or sea-level extreme, and $Z_1 = 200$ km is the higher extreme altitude for which the approximation is attempted. The variable $f(Z)$ represents the pressure, or the density, in ratio to its sea-level value. The constant coefficients $A_0, \ldots, A_n$ are selected to give a uniformly good approximation, on the given interval,† in the sense that the greatest fractional or percentage error in the variable $f(Z)$ is to be as small as possible. Thus, the absolute error is small at high altitudes, where the pressure, or density, is also small. In Table 4.1 the two sets of coefficients presented are the results of successively refining the approximation 4.1 above, with $n = 11$, for the cases $f(Z) = P/P_0$ and $f(Z) = \rho/\rho_0$, the 1962 Standard pressure ratio and density ratio, respectively. Discrepancies between this approximation and the actual model are presented in Figure 4.1. In computations with these approximations, it is recommended that at least nine and preferably ten decimal digits be carried. The percentage error in each case is less than five percent for the geometric altitude interval 0 to 200 km. The detailed variation of the percentage error as a function of altitude is shown in the curves in Figure 4.1. The pressure was found to be more easily approximated within given limits. The approximation for the pressure has been developed so that its ratio to the approximate density

*The technical basis of the selected profile is given by Champion and Minzner (1963).

†A different interval would generally require a different set of coefficients for best results.

TABLE 4.1.—APPROXIMATION OF 1962 STANDARD UP TO 200 KM BY DIGITAL COMPUTER TECHNIQUE

Altitude range: 0–200 km
Surface values: $P_0 = 1.013250 \times 10^5$ newtons meter^{-2}
$\rho_0 = 1.2250$ kilograms meter^{-3}
Coefficient $A_j | j = 0, 1, \ldots, 11$; A_j has dimensions km^{-j}; see Equation (4.1)]:

j	$f(Z)=\frac{P}{P_0}$	$f(Z)=\frac{\rho}{\rho_0}$
0	+0.1000000000E+01	+0.1000000000E+01
1	+0.3533367370E−01	+0.3393495800E−01
2	−0.7474788290E−03	−0.3433553057E−02
3	+0.2121572232E−03	+0.5497466428E−03
4	−0.1325255219E−04	−0.3228358326E−04
5	+0.5344159692E−06	+0.1106617734E−05
6	−0.1322745646E−07	−0.2291755793E−07
7	+0.1965359762E−09	+0.2902146443E−09
8	−0.1723714966E−11	−0.2230070938E−11
9	+0.8707590786E−14	+0.1010575266E−13
10	−0.2341816445E−16	−0.2482089627E−16
11	+0.2597772972E−19	+0.2548769715E−19

yields, through the perfect gas law, an approximation for the molecular-scale temperature which has a fractional error of less than five percent over the altitude interval 0 to 200 km. The approximations are much less accurate outside this altitude interval and should not be used there; this is also true of the second solution of the approximation problem which is discussed in the next paragraph. With reference to Eq. (4.1), it is noted that changing A_0 or both A_0 and A_1 will produce changes which are appreciable at low altitudes but tend asymptotically toward zero change at high altitude.

The second solution presented here utilizes the truncated Chebyshev expansion† (Goodwin, 1961; National Bureau of Standards, 1952) for the variable $f(x)$ on the interval $-1 \leq x \leq 1$. In the present case, the independent variable x is related linearly to the geometric altitude Z by

$$x = \frac{2Z}{Z_1} - 1 \text{ or } Z = \frac{Z_1}{2}(x+1). \tag{4.2}$$

As x varies from −1 to 1, Z increases from 0 to Z_1. The variable $f(x)$ in the present case is ln (P/P_0) or ln (ρ/ρ_0), the natural logarithm (base e) of the 1962

†The Chebyshev expansion of a given function $f(x)$ on the interval $-1 \leq x \leq 1$ is the Fourier half-range cosine-series expansion of the corresponding function $F(\theta) \equiv f(\cos\theta)$ on the interval $0 \leq \theta \leq \pi$. The function $\cos(k\theta) = \cos(k \cos^{-1} x) \equiv T_k(x)$ is expressible as a polynomial in x. The Chebyshev polynomials $T_k(\xi)$ and $C_k(\eta)$ are related by definition, according to: $1/2C_k(2\xi) = T_k(\xi)$, $k = 0, 1, 2, \ldots$.

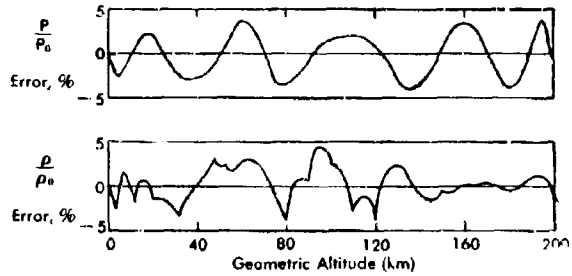

FIGURE 4.1.—Errors in representing the 1962 Standard to 200 km by digital computer technique approximation.

Standard pressure ratio or density ratio, respectively. For small errors, the (absolute) error in approximating the logarithm ln r is approximately equal to the corresponding fractional error in the (pressure or density) ratio r itself, that is,

$$\ln r_a - \ln r = \ln\left(1 + \frac{r_a - r}{r}\right) \doteq \frac{r_a - r}{r} \tag{4.3}$$

where $|(r_a - r)/r|$ is much less than unity and the subscript a refers to the approximate value of r. Therefore, a uniformly good polynomial fit to ln r, in the sense of minimizing the maximum absolute value of the error (ln r_a − ln r) on the interval $0 \leq Z \leq Z_1$, is of interest here. The best polynomial in this sense can be approximated with a truncated Chebyshev expansion. This standard approximation, for ln r, is of the form

$$\ln r \doteq \frac{a_0}{2} + \sum_{k=1}^{n} a_k T_k(x) = \frac{1}{2}\left[a_0 + \sum_{k=1}^{n} a_k C_k(2x)\right] \tag{4.4}$$

where

$$a_k = \frac{2}{\pi}\int_0^{\pi} \ln|r(x)| \cos k\theta d\theta,\ x \equiv \cos\theta \tag{4.5}$$

and (with $\eta \equiv 2x$) the $C_k(\eta)$ can be obtained recursively from

$$C_1(\eta) = \eta, \qquad C_2(\eta) = \eta^2 - 2,$$
$$C_k(\eta) = \eta C_{k-1}(\eta) - C_{k-2}(\eta), \tag{4.6}$$
$$k = 3, 4, \ldots$$

Alternatively, the $C_k(\eta)$ have been tabulated by the National Bureau of Standards (1952). As before, the approximations are not intended for application outside the interval $0 \leq Z \leq Z_1$. The first fifteen Chebyshev series expansion coefficients a_k are presented in Tables 4.2 and 4.3 for the 1962 Standard for the maximum altitudes $Z_1 = 200$ km and $Z_1 = 80$ km, respec-

TABLE 4.2.—APPROXIMATION OF 1962 STANDARD UP TO 200 KM BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–200 km
Surface values: $P_{Z=0}=P_0$, $\rho_{Z=0}=\rho_0$
Chebyshev series expansion coefficients, a_k:

	$\ln \frac{P}{P_{Z=0}}$	$\ln \frac{\rho}{\rho_{Z=0}}$
$k=$ 0	$-0.24470569E+02$	$-0.25415229E+02$
1	$-0.10685861E+02$	$-0.11684380E+02$
2	$+0.22622605E+01$	$+0.18721406E+01$
3	$+0.63433398E+00$	$+0.81660876E+00$
4	[illegible]$948959E-00$	$-0.93811118E-01$
5	[illegible]$1548574E-00$	$-0.30155735E-00$
6	$+0.90751361E-01$	$-0.77593291E-01$
7	$+0.18530467E-00$	$+0.21640168E-00$
8	$-0.95325843E-01$	$-0.34918422E-01$
9	$-0.50214309E-01$	$-0.70126799E-01$
10	$+0.45101378E-01$	$+0.36014616E-01$
11	$+0.88997472E-02$	$+0.14951351E-01$
12	$-0.18935899E-01$	$-0.21450283E-01$
13	$+0.35690621E-02$	$-0.12497995E-02$
14	$+0.63989880E-02$	$+0.18421866E-01$
Maximum error, percent for		
$n=10$	$+0.48716851E+01$	$+0.90159774E+01$
11	$+0.44642039E+01$	$+0.78204393E+01$
12	$+0.27651749E+01$	$+0.62153101E+01$
13	$+0.26185820E+01$	$+0.61527729E+01$
14	$+0.21790823E+01$	$+0.45074701E+01$

TABLE 4.3.—APPROXIMATION OF 1962 STANDARD UP TO 80 KM BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–80 km
Surface values: $P_{Z=0}=P_0$, $\rho_{Z=0}=\rho_0$
Chebyshev series expansion coefficients, a_k:

	$\ln \frac{P}{P_{Z=0}}$	$\ln \frac{\rho}{\rho_{Z=0}}$
$k=$ 0	$-0.11385925E+02$	$-0.10960632E+02$
1	$-0.56837011E+01$	$-0.55717132E+01$
2	$+0.52666476E-01$	$+0.99116555E-01$
3	$-0.77884294E-01$	$+0.61044847E-01$
4	$-0.11004083E-00$	$-0.14304157E-00$
5	$+0.17572339E-01$	$+0.29492088E-02$
6	$+0.48546337E-02$	$+0.58789604E-02$
7	$+0.17694805E-02$	$+0.20421324E-02$
8	$-0.18165298E-02$	$+0.71033206E-02$
9	$-0.26635086E-02$	$-0.10314086E-01$
10	$+0.35685433E-02$	$+0.34107737E-02$
11	$-0.82257517E-03$	$+0.41764325E-02$
12	$-0.10363683E-02$	$-0.39151559E-02$
13	$+0.57053477E-03$	$+0.11227828E-02$
14	$-0.19023078E-03$	$-0.15751053E-02$
Maximum error, percent for		
$n=10$	$+0.32537075E+00$	$+0.25532037E+01$
11	$+0.33326241E+00$	$+0.23517296E+01$
12	$+0.26060434E+00$	$+0.19785941E+01$
13	$+0.25006738E+00$	$+0.18775970E+01$
14	$+0.23898240E+00$	$+0.18222705E+01$

tively. Discrepancies between these approximations and the actual model are presented in Figures 4.2 and 4.3. The two-digit number following the letter E in each numerical expression for a_k is the power of ten by which to multiply the number preceding the letter E. Maximum errors for the altitude interval $0 \leq Z \leq Z_1$ for different truncations ($n=10$ to 14) and errors as a function of altitude are also presented for $n=10$ and $n=14$ in the figures. In Table 4.2 to Table 4.15, P_0 and ρ_0 denote sea-level values from the Standard. Eight decimal digits are recommended in computations.

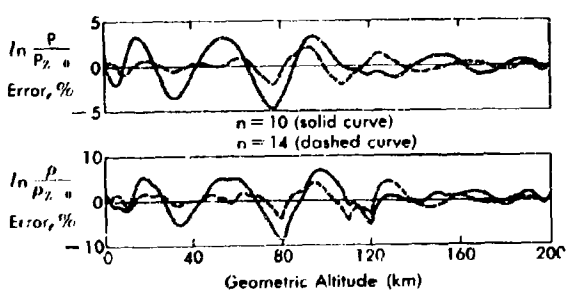

FIGURE 4.2.—Errors in representing the 1962 Standard to 200 km by truncated Chebyshev expansion.

In summary, direct, simple approximations for the 1962 Standard pressure and density (first solution) and their logarithms (second solution) have been presented. The first solution is oriented to the needs for efficient digital-computer operation and requires little in the way of program and storage. The computation of the expansion coefficients in the second solution is very straightforward and can be performed in this or similar problems with little effort or skill in numerical analysis.

4.1.2 U.S. STANDARD ATMOSPHERE SUPPLEMENTS, 1966.—The approximation described in the preceding section and consisting of a truncated Chebyshev series expansion has been applied to the lower 80 km of 13 of the 14 Supplementary Atmospheres described in Parts 2 and 5 to obtain analytic representations of the logarithms of the pressure ratio and density ratio. Since the spring/fall atmosphere is identical to the 1962 Standard up to 69 km, analytic approximation of the spring/fall atmosphere is not described. The expansion coefficients and maximum errors are presented in Tables 4.4 to 4.16. Discrepancies from the Supplementary Atmospheres are illustrated in Figures 4.4 to 4.16. As before, the approximations should not be applied outside the indicated altitude range.

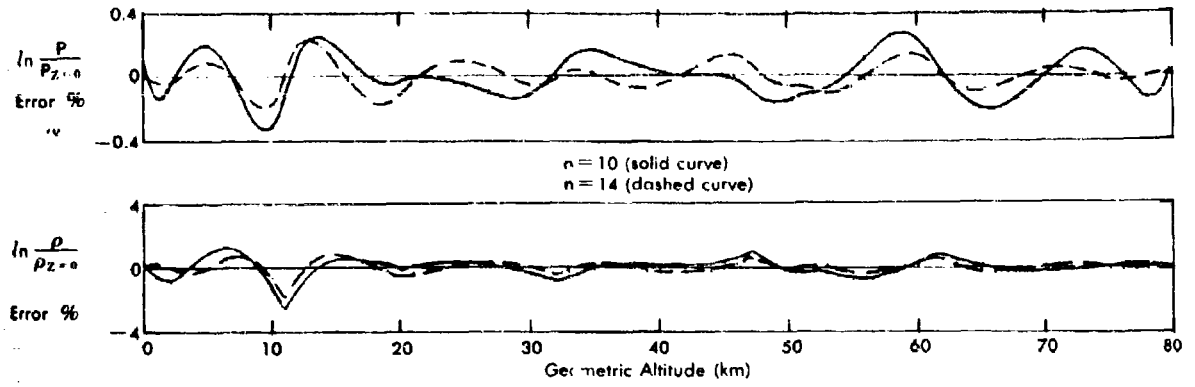

FIGURE 4.3.—Errors in representing the 1962 Standard to 80 km by truncated Chebyshev expansion.

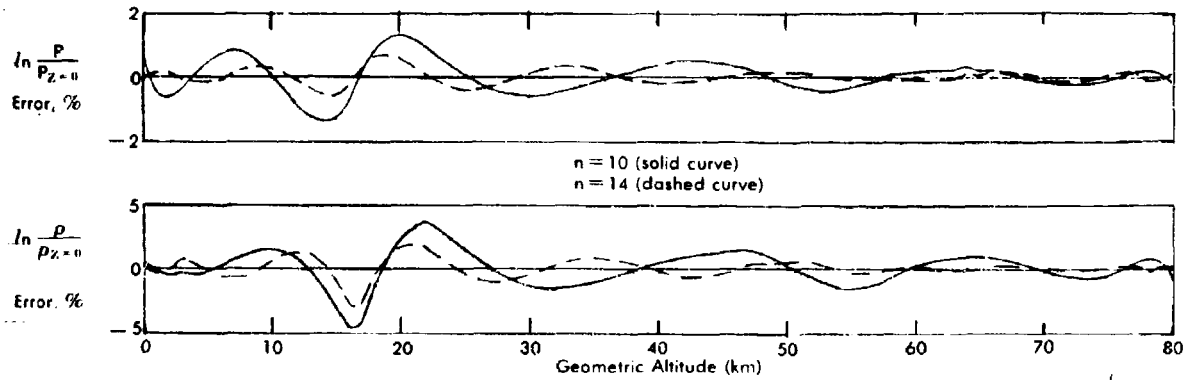

FIGURE 4.4.—Errors in representing the 15° N. Supplementary Atmosphere by truncated Chebyshev expansion.

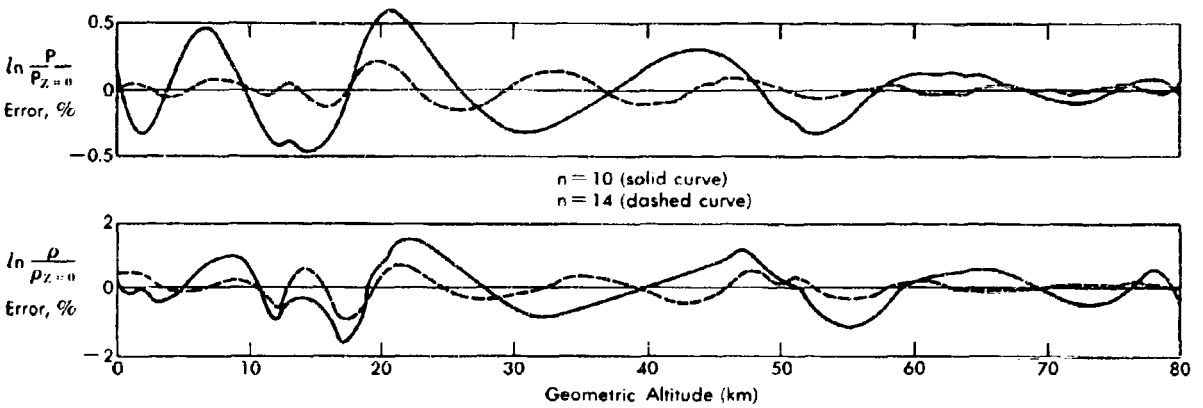

FIGURE 4.5.—Errors in representing the 30° N. Winter Supplementary Atmosphere.

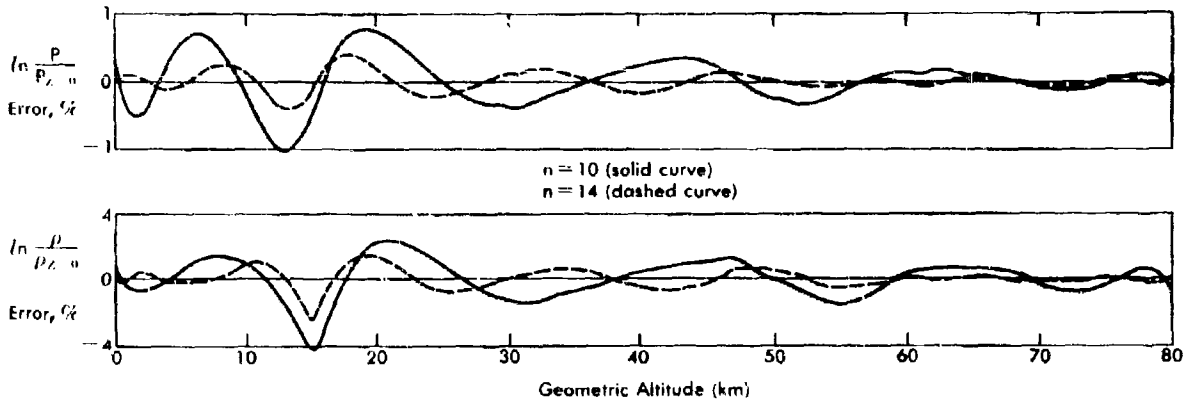

FIGURE 4.6.—Errors in representing the 30° N. Summer Supplementary Atmosphere.

TABLE 4.4.—APPROXIMATION OF 15° N. SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–80 km
Surface values: $P_{z=0} = 1.00000000\ P_0$
$\rho_{z=0} = 0.95265306\ \rho_0$
Chebyshev series expansion coefficients, a_k:

	$\ln \frac{P}{P_{z=0}}$	$\ln \frac{\rho}{\rho_{z=0}}$
$k=$ 0	−0.11292681E+02	−0.10795064E+02
1	−0.56676704E+01	−0.55402267E+01
2	+0.45597384E−01	+0.70185477E−01
3	−0.72563273E−01	+0.73327006E−01
4	−0.11895318E−00	−0.16736365E−00
5	+0.38715330E−01	+0.18269096E−01
6	+0.10858011E−02	+0.22595998E−01
7	−0.72492028E−02	−0.21316435E−01
8	+0.89635745E−02	+0.17031241E−01
9	−0.68378613E−02	−0.13859797E−02
10	−0.33748665E−04	−0.12925811E−01
11	+0.47251073E−02	+0.11510155E−01
12	−0.36550791E−02	−0.52981801E−03
13	+0.31158274E−03	−0.66618895E−02
14	+0.18717224E−02	+0.57506745E−02
Maximum error, percent for		
$n=$ 10	+0.13981993E+01	+0.46770841E+01
11	+0.10743026E+01	+0.38551524E+01
12	+0.78751098E+00	+0.38621232E+01
13	+0.80631923E+00	+0.32812089E+01
14	+0.68477737E+00	+0.27716085E+01

TABLE 4.5.—APPROXIMATION OF 30° N. WINTER SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–80 km
Surface values: $P_{z=0} = 1.00764866\ P_0$
$\rho_{z=0} = 1.00653061\ \rho_0$
Chebyshev series expansion coefficients, a_k:

	$\ln \frac{P}{P_{z=0}}$	$\ln \frac{\rho}{\rho_{z=0}}$
$k=$ 0	−0.11398712E+02	−0.10988053E+02
1	−0.56949156E+01	−0.55952542E+01
2	+0.66612249E−01	+0.89859452E−01
3	−0.66339880E−01	+0.66752831E−01
4	−0.10950316E−00	−0.15432204E−00
5	+0.34772284E−01	+0.14787448E−01
6	+0.36534654E−02	+0.20988461E−01
7	−0.50058098E−02	−0.13602723E−01
8	+0.42671657E−02	+0.13072287E−01
9	−0.49216313E−02	−0.61097701E−02
10	+0.12164620E−02	−0.54250862E−02
11	+0.24253896E−02	+0.67921825E−02
12	−0.19684564E−02	−0.20118331E−03
13	+0.95887702E−05	−0.30992298E−02
14	+0.79097901E−03	+0.17320223E−02
Maximum error, percent for		
$n=$ 10	+0.58665549E+00	+0.16619980E+01
11	+0.44876909E+00	+0.13632268E+01
12	+0.25192475E+00	+0.13729185E+01
13	+0.25144791E+00	+0.10648638E+01
14	+0.21190023E+00	+0.95033348E+00

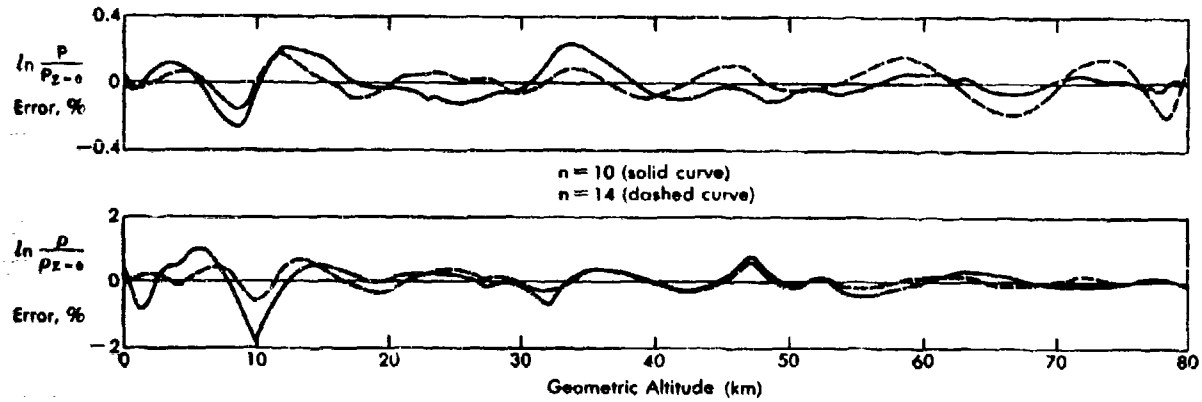

FIGURE 4.7.—Errors in representing the 45° N. Winter Supplementary Atmosphere.

TABLE 4.6.—APPROXIMATION OF 30° N. SUMMER SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0−80 km
Surface values: $P_{z=0} = 1.00024673\ P_0$
$\rho_{z=0} = 0.94612245\ \rho_0$
Chebyshev series expansion coefficients, a_k:

	$\ln \frac{P}{P_{z=0}}$	$\ln \frac{\rho}{\rho_{z=0}}$
$k=$ 0	−0.11236010E+02	−0.10724518E+02
1	−0.56476343E+01	−0.55094862E+01
2	+0.30694294E−01	+0.63777917E−01
3	−0.76259755E−01	+0.71771775E−01
4	−0.12104687E−00	−0.16437107E−00
5	+0.32464208E−01	+0.10906935E−01
6	+0.32257811E−02	+0.20640562E−01
7	−0.55074987E−02	−0.15827267E−01
8	+0.64346058E−02	+0.14407379E−01
9	−0.60729037E−02	−0.27857211E−02
10	+0.10370307E−02	−0.10184736E−01
11	+0.31451757E−02	+0.11202805E−01
12	−0.31532521E−02	−0.34389555E−02
13	+0.10123259E−02	−0.32617962E−02
14	+0.79967239E−03	+0.42496365E−02
Maximum error, percent for		
$n=$ 10	+0.10690240E+01	+0.42787224E+01
11	+0.76824112E+00	+0.32592773E+01
12	+0.49861088E+00	+0.31749964E+01
13	+0.49004091E+00	+0.29780984E+01
14	+0.42920543E+00	+0.25532901E+01

TABLE 4.7.—APPROXIMATION OF 45° N. WINTER SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0−80 km
Surface values: $P_{z=0} = 1.00468789\ P_0$
$\rho_{z=0} = 1.06204082\ \rho_0$
Chebyshev series expansion coefficients, a_k:

	$\ln \frac{P}{P_{z=0}}$	$\ln \frac{\rho}{\rho_{z=0}}$
$k=$ 0	−0.11554944E+02	−0.11262047E+02
1	−0.57394208E+01	−0.56938867E+01
2	+0.10541182E−00	+0.10894386E−00
3	−0.31041097E−01	+0.74802921E−01
4	−0.90912415E−01	−0.12099027E−00
5	+0.19779769E−01	−0.18128609E−02
6	+0.13230478E−01	+0.17643137E−01
7	+0.15098489E−03	+0.79451649E−02
8	−0.65576137E−02	+0.75301915E−03
9	−0.13792823E−02	−0.13910341E−01
10	+0.45829969E−02	+0.61671438E−02
11	−0.11948063E−02	+0.26568258E−02
12	−0.40015894E−03	−0.22915218E−02
13	+0.27888930E−03	+0.21201550E−02
14	−0.33229920E−03	−0.24436811E−02
Maximum error, percent for		
$n=$ 10	+0.26980507E+00	+0.19066200E+01
11	+0.23119020E+00	+0.18811271E+01
12	+0.21727996E+00	+0.17137662E+01
13	+0.19324141E+00	+0.15018404E+01
14	+0.17728639E+00	+0.13139173E+01

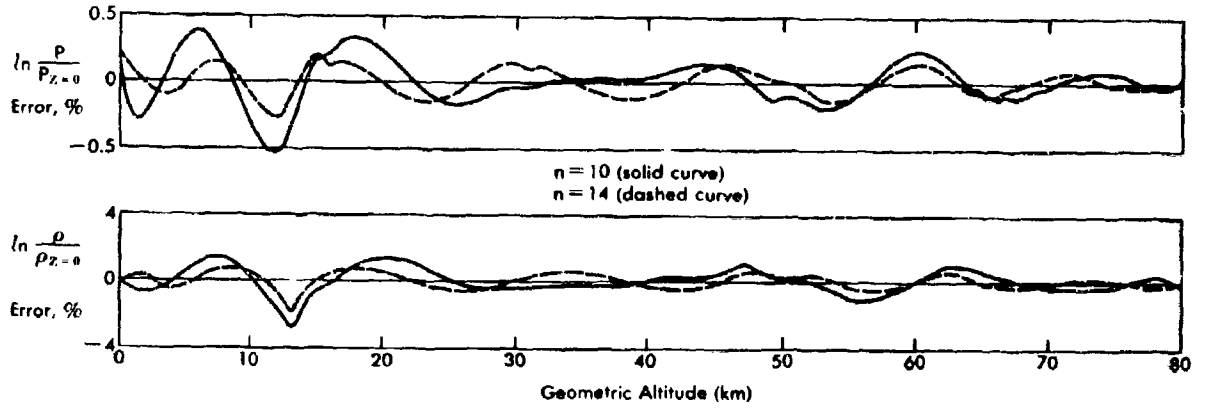

FIGURE 4.8.—Errors in representing the 45° N. Summer Supplementary Atmosphere.

TABLE 4.8.—APPROXIMATION OF 45° N. SUMMER SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0 − 80 km
Surface values: $P_{Z=0} = 1.00024673\ P_0$
$\rho_{Z=0} = 0.97306122\ \rho_0$
Chebyshev series expansion coefficients, a_k:

	$\ln \frac{P}{P_{Z=0}}$	$\ln \frac{\rho}{\rho_{Z=0}}$
$k=$ 0	−0.11150426E+02	−0.10692979E+02
1	−0.55932330E+01	−0.54516427E+01
2	+0.21511737E−01	+0.78517903E−01
3	−0.89873604E−01	+0.58080391E−01
4	−0.11834978E−00	−0.15258813E−00
5	+0.22024347E−01	+0.39089340E−02
6	+0.26686517E−02	+0.12920403E−01
7	−0.23176521E−02	−0.90474822E−02
8	+0.24556559E−02	+0.10975508E−01
9	−0.38195797E−02	−0.70757392E−02
10	+0.25047988E−02	−0.17159607E−02
11	+0.66807698E−03	+0.70322484E−02
12	−0.18029543E−02	−0.36113699E−02
13	+0.82929434E−03	−0.14795569E−03
14	−0.37180569E−03	+0.54964149E−03
Maximum error, percent for		
$n=$ 10	+0.54767413E+00	+0.30291855E+01
11	+0.49553199E+00	+0.23566723E+01
12	+0.31653329E+00	+0.20456657E+01
13	+0.26599004E+00	+0.20487174E+01
14	+0.27117863E+00	+0.20166874E+01

TABLE 4.9.—APPROXIMATION OF 60° N. WINTER SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–80 km
Surface values: $P_{Z=0} = 1.00024673 P_0$
$\rho_{Z=0} = 1.12000000\ \rho_0$
Chebyshev series expansion coefficients, a_k:

	$\ln \frac{P}{P_{Z=0}}$	$\ln \frac{\rho}{\rho_{Z=0}}$
$k=$ 0	−0.11734579E+02	−0.11559304E+02
1	−0.57909640E+01	−0.57942704E+01
2	+0.15565977E+00	+0.14085435E+00
3	+0.43958965E−03	+0.91568527E−01
4	−0.73909307E−01	−0.89026834E−01
5	+0.10612036E−01	−0.91508620E−03
6	+0.81347044E−02	+0.96263019E−02
7	+0.17454704E−02	+0.74983495E−02
8	−0.70900109E−02	+0.66805500E−03
9	−0.10257863E−02	−0.15687198E−01
10	+0.36946803E−02	+0.69099183E−02
11	−0.53343711E−03	−0.25275559E−02
12	+0.16436473E−02	+0.40577084E−02
13	−0.12242473E−02	+0.35777159E−02
14	−0.84107635E−03	−0.46009748E−02
Maximum error, percent for		
$n=$ 10	+0.42302819E+00	+0.17953478E+01
11	+0.38139584E+00	+0.16184054E+01
12	+0.26048484E+00	+0.15816823E+01
13	+0.24649215E+00	+0.13898768E+01
14	+0.20221931E+00	+0.96897483E+00

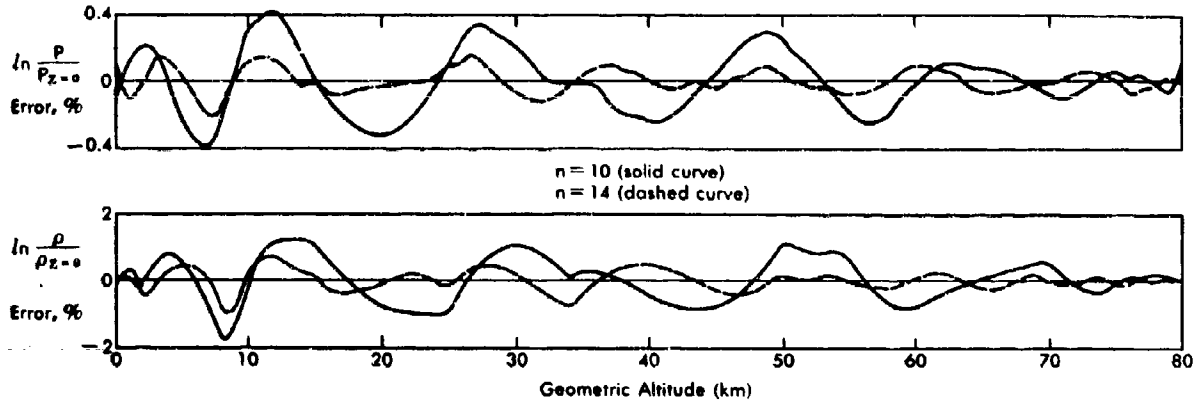

FIGURE 4.9.—Errors in representing the 60° N. Winter Supplementary Atmosphere.

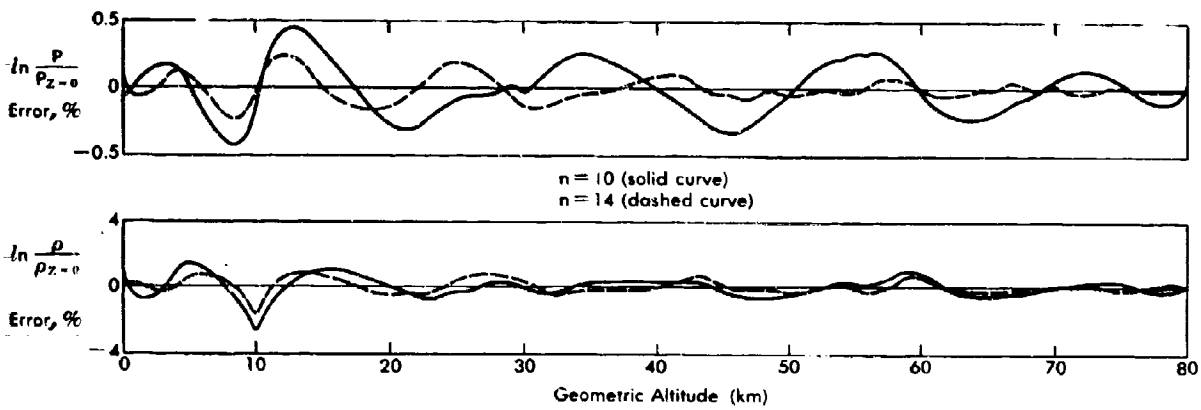

FIGURE 4.10.—Errors in representing the 60° N. Summer Supplementary Atmosphere.

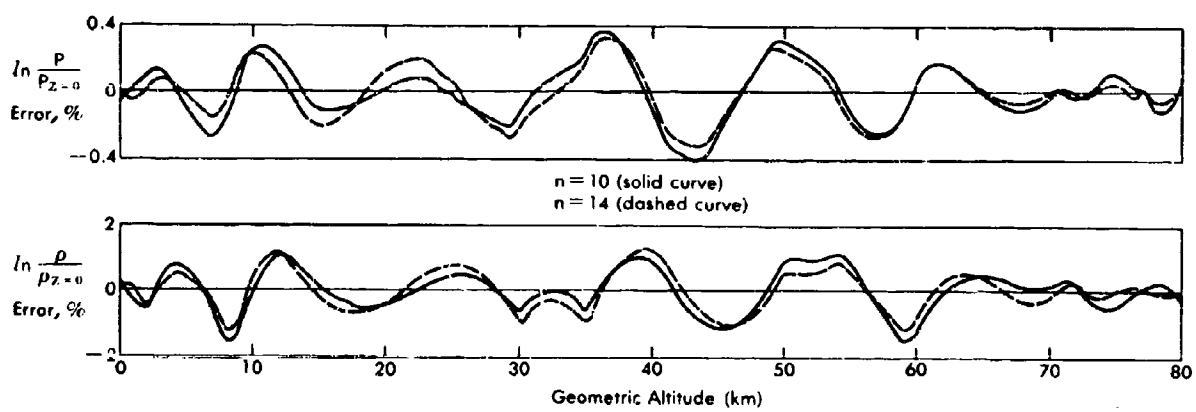

FIGURE 4.11.—Errors in representing the 60° N. Winter (Cold) Supplementary Atmosphere.

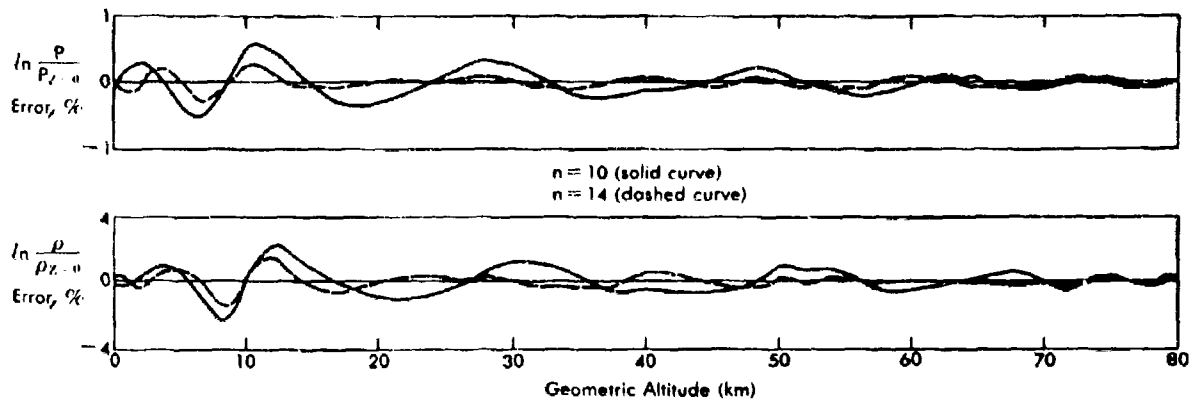

FIGURE 4.12.—Errors in representing the 60° N. Winter (Warm) Supplementary Atmosphere.

TABLE 4.10.—APPROXIMATION OF 60° N. SUMMER SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–80 km
Surface values: $P_{Z=0} = 0.99679250\ P_0$
$\rho_{Z=0} = 0.99591837\ \rho_0$
Chebyshev series expansion coefficients, a_k:

	$\ln \frac{P}{P_{Z=0}}$	$\ln \frac{\rho}{\rho_{Z=0}}$
$k = 0$	$-0.11113715E+02$	$-0.10702847E+02$
1	$-0.55552451E+01$	$-0.54172088E+01$
2	$+0.14711463E-01$	$+0.94875743E-01$
3	$-0.10813282E-00$	$+0.33971231E-01$
4	$-0.11288266E-00$	$-0.14385514E-00$
5	$+0.13886823E-01$	$-0.22402754E-02$
6	$+0.45754226E-02$	$+0.47746203E-02$
7	$+0.15378256E-02$	$+0.19455712E-02$
8	$-0.14691148E-02$	$+0.62006716E-02$
9	$-0.11931194E-02$	$-0.74573795E-02$
10	$+0.20596717E-02$	$+0.49698568E-02$
11	$-0.20676183E-02$	$-0.10657856E-02$
12	$+0.45563554E-03$	$-0.45141339E-02$
13	$+0.83081386E-03$	$+0.36185520E-02$
14	$-0.35421627E-03$	$-0.17352670E-02$
Maximum error, percent for		
$n = 10$	$+0.47194607E+00$	$+0.26714161E+01$
11	$+0.31524203E+00$	$+0.26816413E+01$
12	$+0.33107898E+00$	$+0.23519516E+01$
13	$+0.25946698E+00$	$+0.19902498E+01$
14	$+0.24612195E+00$	$+0.18568054E+01$

TABLE 4.11.—APPROXIMATION OF 60° N. WINTER (COLD) SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–80 km
Surface values: $P_{Z=0} = 1.00024673\ P_0$
$\rho_{Z=0} = 1.12000000\ \rho_0$
Chebyshev series expansion coefficients, a_k:

	$\ln \frac{P}{P_{Z=0}}$	$\ln \frac{\rho}{\rho_{Z=0}}$
$k = 0$	$-0.11986395E+02$	$-0.11811448E+02$
1	$-0.59219413E+01$	$-0.59543981E+01$
2	$+0.19521780E-00$	$+0.13822599E-00$
3	$+0.49710290E-01$	$+0.13723169E-00$
4	$-0.78022972E-01$	$-0.85309979E-01$
5	$+0.84323914E-02$	$-0.80034570E-02$
6	$+0.17658515E-01$	$+0.24007255E-01$
7	$-0.84813241E-03$	$+0.16226391E-01$
8	$-0.14690644E-01$	$-0.85207421E-02$
9	$-0.62825929E-03$	$-0.23385217E-01$
10	$+0.72435819E-02$	$+0.92265872E-02$
11	$-0.75193853E-03$	$+0.48266426E-03$
12	$+0.31587886E-03$	$+0.17416397E-02$
13	$-0.15014646E-03$	$+0.30251177E-02$
14	$-0.35626103E-03$	$-0.13604895E-02$
Maximum error, percent for		
$n = 10$	$+0.40051306E+00$	$+0.15021086E+01$
11	$+0.34523572E+00$	$+0.14942810E+01$
12	$+0.32561983E+00$	$+0.14713630E+01$
13	$+0.33805336E+00$	$+0.13232782E+01$
14	$+0.34828052E+00$	$+0.12660265E+01$

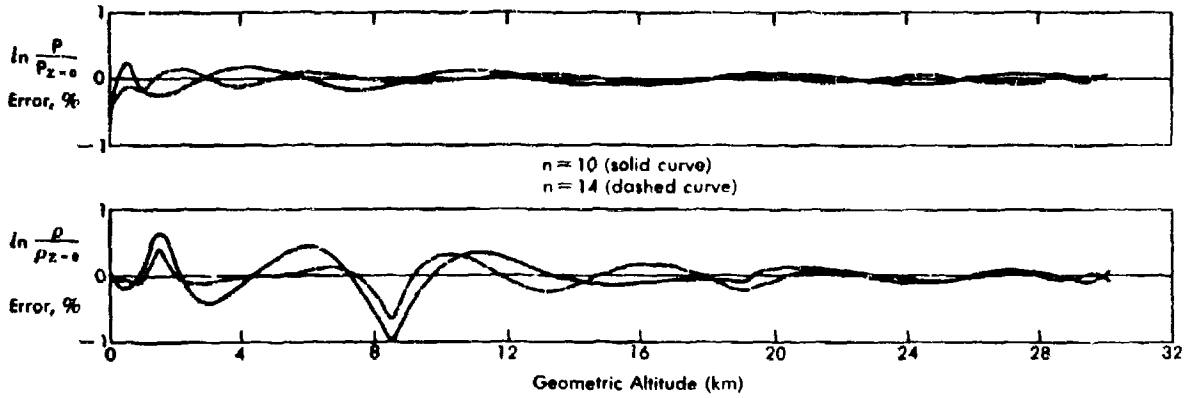

FIGURE 4.13.—Errors in representing the 75° N. Winter Supplementary Atmosphere.

TABLE 4.12.—APPROXIMATION OF 60° N. WINTER (WARM) SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–80 km
Surface values: $P_{z-0} = 1.00024673\ P_0$
$\rho_{z-0} = 1.12000000\ \rho_0$
Chebyshev series expansion coefficients, a_k:

	$\ln \frac{P}{P_{z-0}}$	$\ln \frac{\rho}{\rho_{z-0}}$
$k=$ 0	−0.11454033E + 02	−0.11290984E + 02
1	−0.56620422E + 01	−0.56411071E + 01
2	+0.96319649E − 01	+0.11306966E − 00
3	−0.44269729E − 01	+0.32309052E − 01
4	−0.66507997E − 01	−0.97161151E − 01
5	+0.11909655E − 01	−0.69107811E − 02
6	+0.10722589E − 01	+0.34919044E − 03
7	+0.96289317E − 02	+0.15701751E − 01
8	−0.52646790E − 02	+0.93187094E − 02
9	−0.27010841E − 02	−0.12750375E − 01
10	+0.19167302E − 02	+0.63867828E − 02
11	−0.75229670E − 03	−0.45595561E − 02
12	+0.17112380E − 02	+0.43776657E − 02
13	−0.16415112E − 02	+0.16522544E − 02
14	−0.26017816E − 03	−0.57111861E − 02
Maximum error, percent for		
$n=$ 10	+0.57345495E + 00	+0.24867050E + 01
11	+0.53716466E + 00	+0.21675125E + 01
12	+0.37407592E + 00	+0.21099091E + 01
13	+0.30930995E + 00	+0.20290285E + 01
14	+0.29561429E + 00	+0.15065640E + 01

TABLE 4.13.—APPROXIMATION OF 75° N. WINTER SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–30 km
Surface values: $P_{z-0} = 1.00024673\ P_0$
$\rho_{z-0} = 1.15673469\ \rho_0$
Chebyshev series expansion coefficients, a_k:

	$\ln \frac{P}{P_{z-0}}$	$\ln \frac{\rho}{\rho_{z-0}}$
$k=$ 0	−0.46585828E + 01	−0.43716063E + 01
1	−0.23793183E + 01	−0.22828183E + 01
2	−0.45720632E − 01	−0.93555254E − 01
3	+0.18766651E − 01	+0.28645270E − 01
4	−0.37170666E − 02	+0.23819977E − 02
5	−0.11334217E − 02	−0.10561099E − 01
6	+0.26667524E − 02	+0.10428505E − 01
7	−0.28777064E − 02	−0.50128486E − 02
8	+0.18202721E − 02	−0.79128043E − 03
9	−0.74578723E − 03	+0.18741237E − 02
10	+0.75868630E − 03	+0.54691744E − 03
11	−0.11159275E − 02	−0.13866626E − 02
12	+0.12249412E − 02	+0.14015084E − 03
13	−0.10232393E − 02	+0.11944472E − 02
14	+0.80900566E − 03	−0.16713684E − 02
Maximum error, percent for		
$n=$ 10	+0.81750139E + 00	+0.10199890E + 01
11	+0.70591864E + 00	+0.88459402E + 00
12	+0.58342451E + 00	+0.87593496E + 00
13	+0.48110057E + 00	+0.82325637E + 00
14	+0.40020000E + 00	+0.65612495E + 00

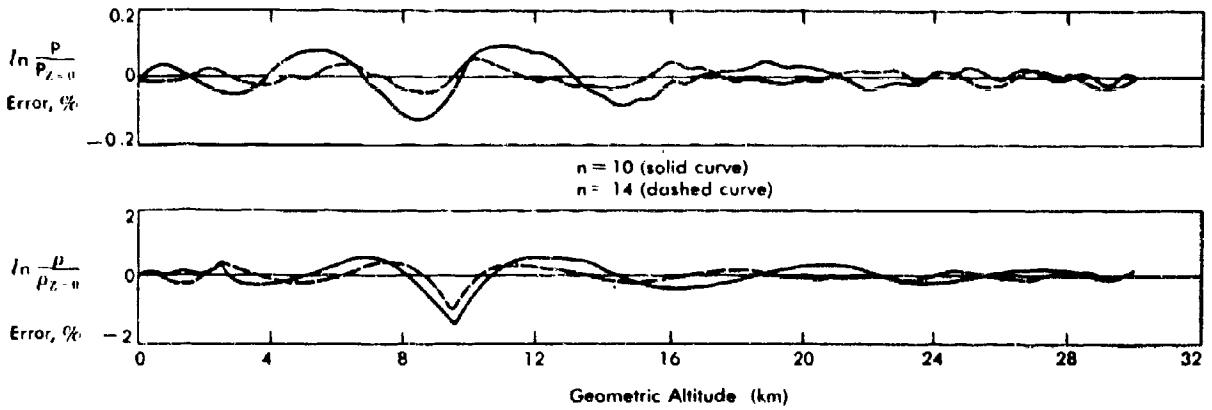

FIGURE 4.14. – Errors in representing the 75° N. Summer Supplementary Atmosphere.

TABLE 4.14. – APPROXIMATION OF 75° N. SUMMER SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–30 km
Surface values: $P_{Z=0} = 0.99925981\ P_0$
$\rho_{Z=0} = 1.03265306\ \rho_0$
Chebyshev series expansion coefficients, a_k:

	$\ln \frac{P}{P_{Z=0}}$	$\ln \frac{\rho}{\rho_{Z=0}}$
$k = 0$	$-0.42278519E+01$	$-0.39573638E+01$
1	$-0.21708018E+01$	$-0.20952640E+01$
2	$-0.29043083E-01$	$-0.94215480E-01$
3	$+0.24327983E-01$	$+0.38691153E-01$
4	$-0.70768897E-02$	$-0.19255719E-02$
5	$+0.39061656E-03$	$-0.13326340E-01$
6	$+0.30080657E-02$	$+0.11360621E-01$
7	$-0.20413522E-02$	$+0.10086802E-02$
8	$-0.31845975E-03$	$-0.54632690E-02$
9	$+0.86191803E-03$	$+0.20982994E-02$
10	$-0.30671941E-03$	$+0.13258500E-02$
11	$-0.23462532E-03$	$-0.20557834E-02$
12	$+0.40526052E-03$	$-0.39581369E-03$
13	$+0.65274826E-04$	$+0.23348878E-02$
14	$-0.24463654E-03$	$-0.62716101E-03$
Maximum error, percent for		
$n = 10$	$+0.12279234E+00$	$+0.14662445E+01$
11	$+0.99883296E-01$	$+0.12945935E+01$
12	$+0.74847855E-01$	$+0.12864456E+01$
13	$+0.71968951E-01$	$+0.10562479E+01$
14	$+0.52774628E-01$	$+0.10238126E+01$

TABLE 4.15. – APPROXIMATION OF 75° N. WINTER (COLD) SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–30 km
Surface values: $P_{Z=0} = 1.00024673\ P_0$
$\rho_{Z=0} = 1.15673469\ \rho_0$
Chebyshev series expansion coefficients, a_k:

	$\ln \frac{P}{P_{Z=0}}$	$\ln \frac{\rho}{\rho_{Z=0}}$
$k = 0$	$-0.46979427E+01$	$-0.44018058E+01$
1	$-0.24385498E+01$	$-0.23125096E+01$
2	$-0.70155064E-01$	$-0.11547751E-00$
3	$+0.19577885E-01$	$+0.22280943E-01$
4	$-0.30149859E-02$	$+0.46783411E-02$
5	$-0.21707308E-03$	$-0.10539889E-01$
6	$+0.14251117E-02$	$+0.89370371E-02$
7	$-0.12219627E-02$	$-0.40615459E-02$
8	$+0.50480209E-03$	$+0.32793775E-03$
9	$+0.12261519E-03$	$+0.13813689E-02$
10	$-0.30169548E-03$	$+0.14296263E-03$
11	$-0.43468288E-04$	$-0.14171108E-02$
12	$+0.31536786E-03$	$-0.67675316E-04$
13	$-0.45298677E-04$	$+0.14122584E-02$
14	$-0.19354323E-04$	$-0.13300160E-02$
Maximum error, percent for		
$n = 10$	$+0.73231601E-01$	$+0.82924217E+00$
11	$+0.69713437E-01$	$+0.69087446E+00$
12	$+0.50133939E-01$	$+0.69505423E+00$
13	$+0.46390140E-01$	$+0.63276887E+00$
14	$+0.47741675E-01$	$+0.49977154E+00$

2-446 O - 67 - 7

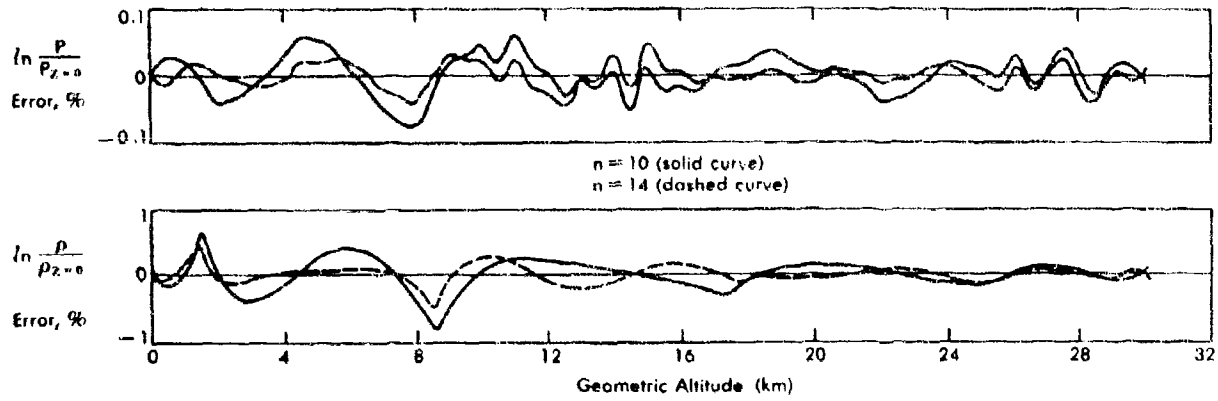

FIGURE 4.15.—Errors in representing the 75° N. Winter (Cold) Supplementary Atmosphere.

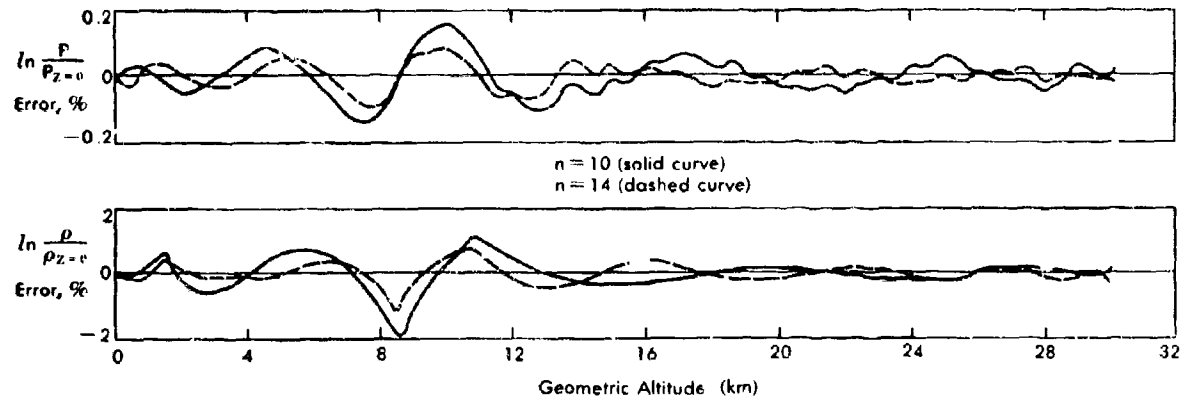

FIGURE 4.16.—Errors in representing the 75° N. Winter (Warm) Supplementary Atmosphere.

4.2 MID-LATITUDE OZONE MODEL TO 50 KILOMETERS

Observations from the ozonesonde network in North America, established in January 1963 (Hering and Borden, 1964), have been combined with rocket measurements and photochemical equilibrium calculations to provide a Mid-latitude Ozone Model which is a tentative annual mean of mid-latitude ozone data to 50 km.

4.2.1. DATA.—The lower 34-km portion of the ozone model is based on the data obtained from the systematic program of weekly ozonesonde ascents made throughout the year 1963 at Seattle, Washington; Fort Collins, Colorado; Madison, Wisconsin; and Bedford, Massachusetts. The mean profile represents the average of mean annual profiles computed for these stations after first averaging individual sounding data over 2-km vertical intervals. Approximately 150 ozonesonde ascents were used in the determination of the mean ozone profile.

The mean annual ozone distribution for heights above 34 km has been determined by analysis of photochemical equilibrium distributions as calculated by Dütsch (1956), Craig (1950), Leovy (1964), and London and Prabhakara (1962) in combination with rocket measurements over New Mexico by Johnson et al. (1951) in June 1949 and over Wallops Island by Reed and Scolnick (1964) in May 1960. Most weight was assigned to the rocket measurements in defining the ozone model, although there is rather good agreement with the theoretical distributions.

Table 4.17 gives the vertical distribution of ozone pressure, density, number density, and mixing ratio in the Mid-latitude Ozone Model to 50 km. Total ozone content, also provided, represents the depth of ozone contained in a square centimeter column of the atmosphere at standard pressure and temperature, STP (1013.25 mb and 273.15° K). Figures 4.17, 4.18, 4.19, and 4.20 show the partial pressure, density, number density, and mixing ratio profiles, respectively.

4.2.2 LIMITATIONS OF MODEL.—Although the ozonesonde observations to 34 km were taken at locations extending from Seattle, Washington, to Bedford, Massachusetts, a region covering 51° of longitude, results are considered, tentatively, as typical

TABLE 4.16.—APPROXIMATION OF 75° N. WINTER (WARM) SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–30 km
Surface values: $P_{Z=0} = 1.00024673\ P_0$
$\rho_{Z=0} = 1.15673469\ \rho_0$
Chebyshev series expansion coefficients, a_k:

	$\ln \frac{P}{P_{Z=0}}$	$\ln \frac{\rho}{\rho_{Z=0}}$
$k=0$	$-0.44657178E+01$	$-0.43199761E+01$
1	$-0.22651483E+01$	$-0.22321204E+01$
2	$-0.77951595E-02$	$-0.59124081E-01$
3	$+0.19291746E-01$	$+0.32498859E-01$
4	$-0.70020744E-02$	$-0.61137000E-02$
5	$+0.23696890E-02$	$-0.10065819E-01$
6	$+0.15803441E-02$	$+0.13643993E-01$
7	$-0.21835677E-02$	$-0.65008923E-02$
8	$+0.11009927E-02$	$-0.49258938E-03$
9	$+0.22904447E-03$	$+0.37893999E-02$
10	$-0.76817563E-03$	$-0.10783633E-02$
11	$+0.16950855E-03$	$-0.26967059E-02$
12	$+0.44253781E-03$	$+0.16621970E-02$
13	$-0.35313824E-03$	$+0.12531816E-02$
14	$-0.10111955E-04$	$-0.27423631E-02$
Maximum error, percent for		
$n=10$	$+0.15889272E+00$	$+0.18673599E+01$
11	$+0.14936939E+00$	$+0.16040519E+01$
12	$+0.12314335E+00$	$+0.15013710E+01$
13	$+0.89350497E-01$	$+0.14461011E+01$
14	$+0.89396691E-01$	$+0.11718735E+01$

of mid-latitude conditions around the northern hemisphere. Also, the representativeness of the ozone model based on the 1963 data was checked by comparison with available 1964 observations. Since fully-processed 1964 data were incomplete, 8-month averages were compared. The difference in average density was only 1×10^{-9} kg m^{-3} or 0.3 percent at 20 km and 2.1×10^{-8} kg m^{-3} or 11 percent at 14 km. The relatively large difference at 14 km probably results from the inter-annual change in the mean position of the tropospheric wind maximum and the associated change in tropopause height.

4.2.3 VARIABILITY.—Standard deviations of ozone density about the model are presented in Table 4.18 for 2-km intervals between the surface and 30 km. They are based on 244 ozonesonde network observations taken during 1963 and 1964. Consequently, the computed rms values include seasonal as well as synoptic-scale variations.

It is apparent from these data that the level of maximum variability lies near 12 km, with minimum variations near 4 km and 30 km or higher. All values, however, must be considered as first estimates due to the limited number of observations currently available. Also, the distribution of ozone seems to be skewed rather than normal, particularly in the lower stratosphere.

The existence of longer-period fluctuations also has been investigated. Angell and Korshover (1964),

TABLE 4.17.—MID-LATITUDE OZONE MODEL

Altitude		Pressure		Density	Number Density	Mixing Ratio
H, m'	Z, m	P, mb	P, mm	ρ, kg m^{-3}	n, m^{-3}	w, kgkg^{-1}
2000	2001	2.4 −5	1.8 −5	5.4 −8	6.7 +17	5.0 −8
4000	4003	2.2	1.6	4.6	5.8	6.0
6000	6006	2.0	1.5	4.5	5.7	7.0
8000	8010	2.0	1.5	5.2	6.5	1.0 −7
10000	10016	3.5	2.6	9.0	1.13+18	2.2
12000	12023	6.1	4.6	1.61−7	2.02	5.2
14000	14031	7.0	5.2	1.87	2.34	8.2
16000	16040	8.8	6.6	2.35	2.94	1.42 −6
18000	18051	1.21−4	9.1	3.22	4.05	2.67
20000	20063	1.42	1.06−4	3.80	4.77	4.31
22000	22076	1.46	1.10	3.87	4.85	6.07
24000	24091	1.38	1.04	3.62	4.54	7.82
26000	26107	1.24	9.3 −5	3.21	4.03	9.53
28000	28124	1.00	7.5	2.58	3.23	1.048−5
30000	30142	8.0 −5	6.0	2.03	2.55	1.129
32000	32162	6.4	4.8	1.61	2.02	1.217
34000	34183	5.0	3.8	1.24	1.56	1.294
36000	36205	3.8	2.8	9.2 −8	1.16	1.314
38000	38229	2.9	2.2	6.9	8.6 +17	1.324
40000	40253	2.1	1.6	4.9	6.1	1.267
42000	42279	1.4	1.0	3.2	4.1	1.124
44000	44307	9.0 −6	6.8 −6	2.1	2.6	9.52 −6
46000	46335	6.0	4.5	1.2	1.6	7.62
48000	48365	3.0	2.2	7.0 −9	9.0 +16	5.81
50000	50396	2.0	1.5	4.0	5.0	4.00

TOTAL OZONE=347 matm-cm (milli-atmosphere-centimeters), STP
=0.347 cm, STP

NOTE: 1. Values of ozone density in units of matm-cm/km may be obtained by multiplying the above values of ozone density by 0.467×10^{6}.
2. Values of ozone mixing ratio in units of parts per million by volume may be obtained by multiplying the above values of ozone mixing ratio by 0.603×10^{6}.

TABLE 4.18.—STANDARD DEVIATION OF OBSERVED OZONE DENSITY ABOUT MODEL

Altitude H, m'	SD, ρ (kg m^{-3})	Altitude H, m'	SD, ρ (kg m^{-3})
2000	3.0 −8		
4000	2.3	18000	9.8−8
6000	2.4	20000	7.8
8000	4.7	22000	6.5
10000	9.8	24000	4.9
12000	1.26−7	26000	4.4
14000	1.18	28000	4.4
16000	1.13	30000	4.0

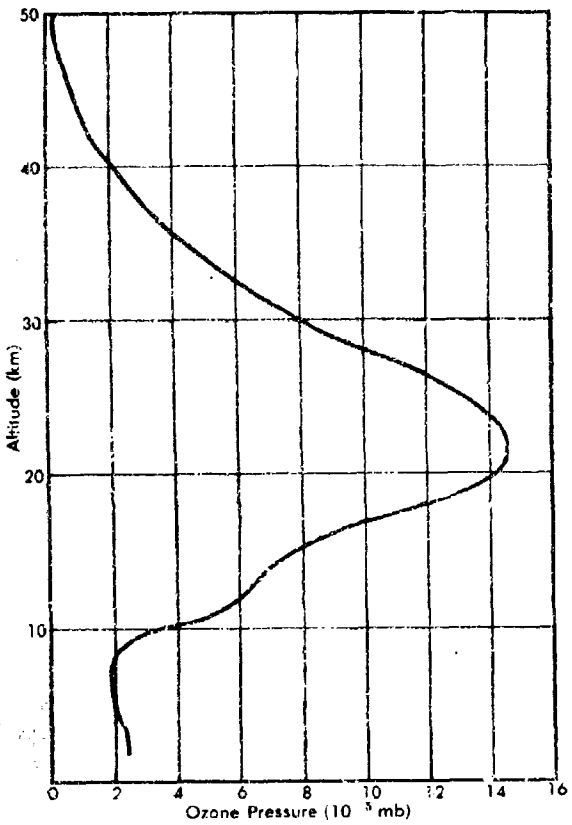

FIGURE 4.17.—Tentative mean annual mid-latitude ozone pressure.

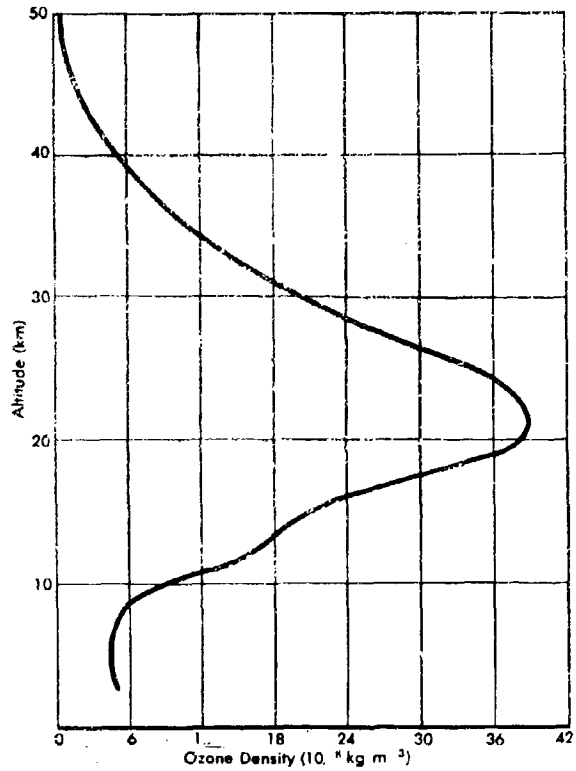

FIGURE 4.18.—Tentative mean annual mid-latitude ozone density.

for example, analyzed quasi-biennial variations in total ozone. Statistically significant biennial oscillations were found at all latitudes. The amplitude in mid-latitudes averages roughly 5 matm-cm. These fluctuations are small compared to total ozone values and synoptic-scale variability in the stratosphere.

4.3 GEOPOTENTIAL-GEOMETRIC ALTITUDE RELATIONS

4.3.1 INTRODUCTION.—This section presents a geopotential table which leads to the geometric altitude of equal geopotential surfaces at various latitudes in 15-degree increments from 0 to 90 degrees.

4.3.2 DEFINITION AND METHOD OF CALCULATION.—Geopotential H_ϕ of a unit mass, at a given latitude ϕ, relative to the reference geopotential at the earth's surface Z_0 at the same latitude, varies with geometric altitude Z and with the altitude-dependent acceleration of gravity $g_\phi(Z)$ for that latitude in accordance with the following integral equation:

$$H_\phi = \int_{Z_0}^{Z} g_\phi(Z)dZ \qquad (4.7)$$

Approaches of considerable though varying sophistication have been employed in recent years in the determination of a function of Z which permits the perfect integration of Eq. (4.7), and thus leads to numerical values of H_ϕ (List, 1963; Minzner and Ripley, 1956; Minzner et al., 1958; *U.S. Standard Atmosphere, 1962*) for specified values of Z. The extreme differences in the values of H_ϕ for a given value of Z as determined by any of these methods are very small compared with the uncertainties of the atmospheric properties tabulated in this document for the same value of Z. Thus, it is reasonable that the simpler of these sophisticated methods (List, 1963; Minzner and Ripley, 1956) be employed in the calculation of geopotential for use with atmospheric properties in these tables. The more complicated and more sophisticated of these referenced methods, that is, the method used in the *U.S. Standard Atmosphere, 1962*, yields a value of H_ϕ at 700 km which differs by less than 0.007 percent from that computed for these Supplementary Atmospheres for the same latitude.

Analytical relationships for H_ϕ as a function of Z, and for Z_ϕ as a function of H, both stemming from Eq. (4.7), are arrived at by replacing $g_\phi(Z)$ with a specialized form of the inverse-square law prior to the integration of Eq. (4.7). The resulting relationships are:

$$H_\phi(Z) \equiv H_\phi = \frac{r_\phi Z}{r_\phi + Z} \cdot \frac{g_\phi}{G} \qquad (4.8)$$

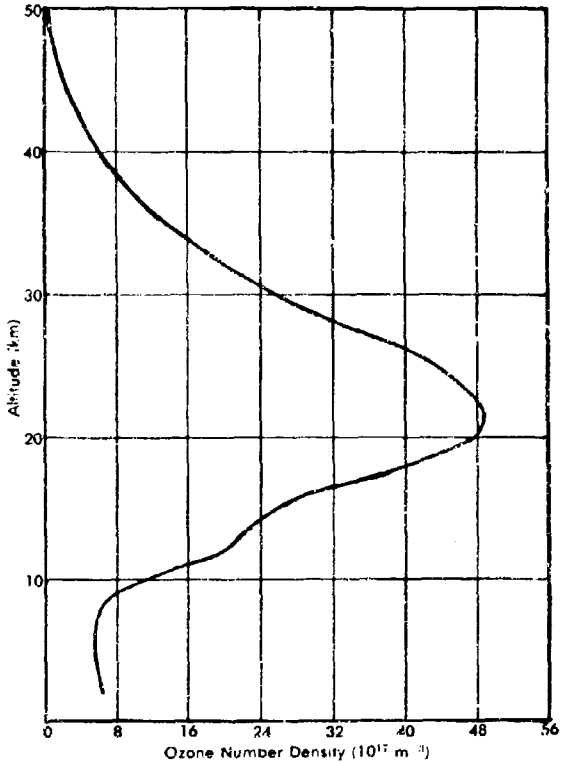

FIGURE 4.19.—Tentative mean annual mid-latitude ozone number density.

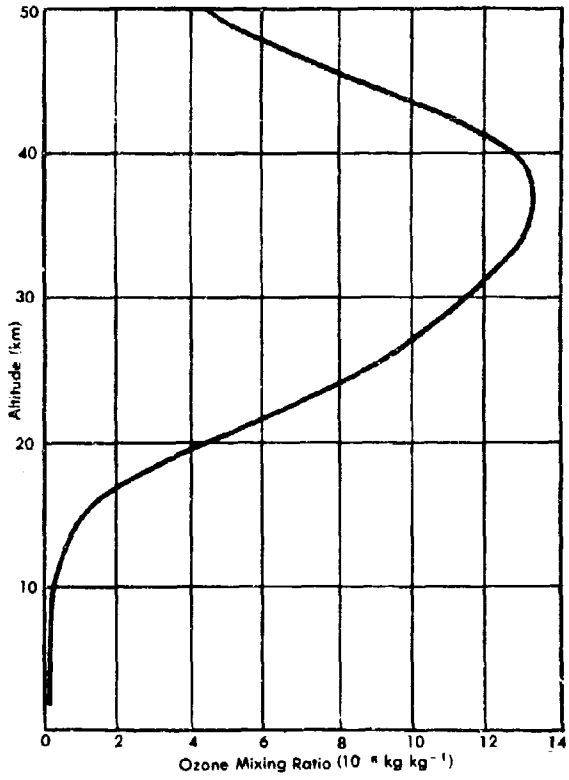

FIGURE 4.20.—Tentative mean annual mid-latitude ozone mixing ratio.

and

$$Z_\phi(H) \equiv Z_\phi = \frac{r_\phi H}{\frac{r_\phi g_\phi}{G} - H} \tag{4.9}$$

where

$H_\phi(Z) \equiv H_\phi$ = geopotential at latitude ϕ in geopotential meters (m′) as a function of geometric altitude Z

$Z_\phi(H) \equiv Z_\phi$ = geometric altitude at latitude ϕ in geometric meters (m) as a function of geopotential H,

$G = 9.80665$ m^2 sec^{-2} (m′)$^{-1}$, which value implicitly defines one standard geopotential meter

g_ϕ = the sea-level value of the acceleration of gravity at latitude ϕ, (m sec^{-2})

r_ϕ = the effective earth's radius for latitude ϕ, (m)

For any latitude ϕ, the value of r_ϕ is generally not equal to the earth's radius for that latitude, but rather is a quantity calculated to meet certain boundary conditions (List, 1963; Minzner and Ripley, 1956, Appendix M), such that relationships of Eqs. (4.8) and (4.9) retain a high degree of validity over an extended range of altitudes at all latitudes in the geopotential table.

Geopotentials have been calculated for eight latitudes listed in Table 4.19, which also shows the related values of r_ϕ and g_ϕ employed in the calculations.

TABLE 4.19.—VALUES OF r_ϕ AND g_ϕ EMPLOYED IN THE CALCULATION OF GEOPOTENTIAL AT VARIOUS LATITUDES

ϕ	r_ϕ	g_ϕ
45°32′33″	6,356,766	9.80665
0°	6,334,984	9.78036
15°	6,337,838	9.78381
30°	6,345,653	9.79324
45°	6,356,360	9.80616
60°	6,367,103	9.81911
75°	6,374,972	9.82860
90°	6,377,862	9.83208

The values of g_ϕ and r_ϕ applicable to latitudes 0°, 15°, 30°, 45°, 60°, 75°, and 90° as used in the geopotential calculations of this document were taken from Table 167 and Table 49, respectively, of the Smithsonian Tables (List, 1963). No values of g_ϕ and r_ϕ are given in the Smithsonian Tables, however, for the reference latitude, $R = 45°32′33″$.

The reference latitude is not an arbitrary value for which the appropriate value of g_ϕ must be found but, rather, R is the latitude associated with the so-called standard acceleration of gravity equal to 9.80665 m sec^{-2} as designated in all U.S. Standard Atmospheres published after 1922. If the latitude variation of the sea-level value of the acceleration of gravity is assumed to follow the Lambert equation (List, 1963), that is,

$$g_\phi = 9.806160(1 - 0.0026373 \cos 2\phi + 0.0000059 \cos^2 2\phi) \quad (4.10)$$

the value of ϕ which satisfies this equation for $g_\phi = 9.80665$ m sec^{-2} is found to be $\phi = 45°32'33'' = R$. The value of r_ϕ for this latitude was computed in the manner described for the computation of values in Smithsonian Table 49 (List, 1963), or as previously discussed by Minzner and Ripley (1956). The use of this particular pair of values of g_ϕ and r_ϕ in Eq. (4.8) yields values of H_R as a function of Z. The corresponding values of Z and H for latitude R are hereafter referred to as Z_R and H_R and serve as the argument pair in the geopotential tables of this section. With the same values of g_ϕ and r_ϕ, Eq. (4.9) yields values of Z_R as a function of H_R, or as a function of the second member of the argument pair, Z_R and H_R.

Sets of values of Z_ϕ as a function of the second member of the argument pair could be calculated for each latitude by means of Eq. (4.9) and the appropriate values of g_ϕ and r_ϕ. A considerable reduction in the number of columns of print is obtained, however, by listing values of the departure of Z_ϕ from Z_R, in the form of $Z_\phi - Z_R$, as a function of the argument pair for each of the required latitudes.

A comparison of the values of geometric altitude as a function of H in the *U.S. Standard Atmosphere, 1962* with values of Z_R as computed by Eq. (4.9) for the same values of $H = H_R$ at the reference latitude R, shows that these two sets of values of Z depart slowly from each other in accordance with some function of increasing values of H. The analytical expression for computing the 1962 Standard values of Z as a function of H (or vice versa) has not been published, but Minzner (1966) has shown that the unrounded 1962 Standard values of Z as a function of H are very closely approximated by an empirical function Z_s which is defined by the following pair of equations:

$$Z_s = \frac{r_R[H + f(H)]}{\frac{r_R g_R}{G} - [H + f(H)]} \quad (4.11)$$

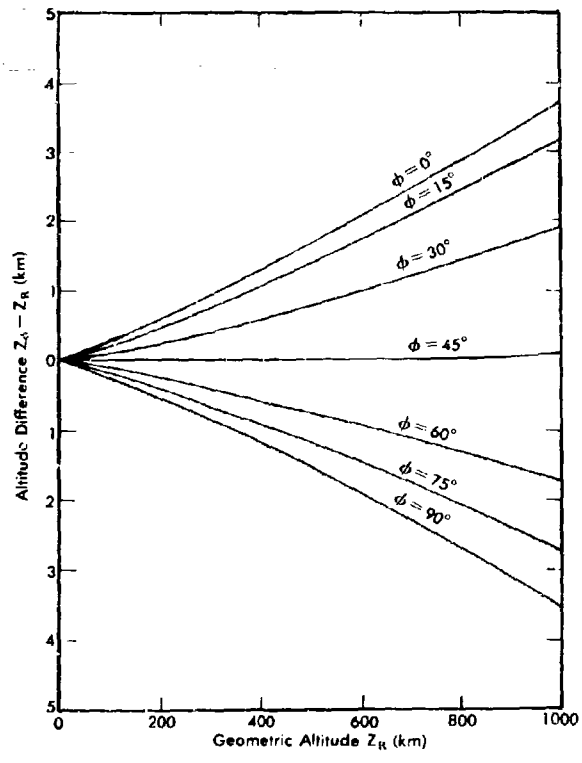

FIGURE 4.21.—Altitude difference ($Z_\phi - Z_R$) as a function of reference altitude Z_R for each of seven latitudes.

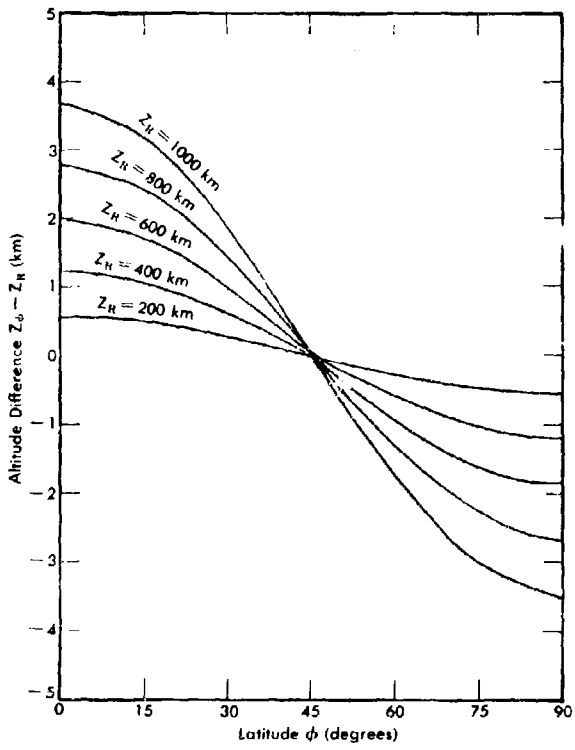

FIGURE 4.22.—Altitude difference ($Z_\phi - Z_P$) as a function of latitude for each of five equal-geopotential surfaces equivalent at the reference latitude to the geometric altitudes 200, 400, 600, 800, and 1000 km.

and

$$f(H) = A' + B'H + C'H^2 + D'H^3 + E'H^4 \quad (4.12)$$

where

$$A' = 0.2579651 \times 10^{-2}\ \text{m}'$$
$$B' = 0.2161710 \times 10^{-7}\ \text{m}'/\text{m}'$$
$$C' = 0.1807561 \times 10^{-10}\ \text{m}'/(\text{m}')^2$$
$$D' = 0.9153012 \times 10^{-16}\ \text{m}'/(\text{m}')^3$$
$$E' = 0.2006785 \times 10^{-22}\ \text{m}'/(\text{m}')^4$$

Since the 1962 Standard like the earlier Standards used 9.80665 m sec^{-2} as the sea-level value of the acceleration of gravity, this 1962 Standard may be associated with the reference latitude 45°32′33″, at least at sea level. Consequently, a comparison of $Z_s(H)$ with $Z_R(H)$ in the form of $(Z_s - Z_R)$ gives an overall indication of the uncertainties introduced into the H to Z relationship by using the simplified expressions of Eqs. (4.8) and (4.9) rather than the complicated method used in the 1962 Standard.

4.3.3 DESCRIPTION OF THE GEOPOTENTIAL TABLE.—The basic format of Table 4.20 is such as to provide one set of values of $Z_\phi - Z_R$ as a function of the argument pair, Z_R and H_R, for each of seven latitudes. The argument pair occupies columns 1 and 2 while the successive sets of values of $Z_\phi - Z_R$, corresponding respectively to each of the seven successive latitudes, occupy the columns 3 through 9. Column 10 contains the set of values of $Z_s - Z_R$.

The particular format of the table is dictated by the large number of entries in the column of Z_R as compared with the small number of values of latitude. Actually, the table will probably find its greatest usefulness in translating atmospheres computed for the reference latitude to other latitudes. From this point of view, latitude is the argument or independent variable and the table is found to provide differences in geometric altitudes for 256 equal geopotential surfaces as a function of latitude. The title of the table reflects this usage.

TABLE 4.20.—*Geometric Altitude Differences $Z_\phi - Z_R$ of Equal-Geopotential Surfaces H_R as a Function of Latitude ϕ, where Reference Latitude R = 45°32′33″*

Geometric Altitude Z_R(m)	Geopotential H_R(m′)	$Z_\phi - Z_R$(m) Latitude ϕ (Deg)							$Z_s - Z_R$
		0	15	30	45	60	75	90	
0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
250.	249.9	0.7	0.6	0.3	0.0	−0.3	−0.6	−0.6	0.0
500.	499.9	1.3	1.2	0.7	0.0	−0.6	−1.1	−1.3	0.0
750.	749.9	2.0	1.8	1.0	0.0	−1.0	−1.7	−1.9	0.0
1000.	999.8	2.7	2.3	1.4	0.0	−1.3	−2.2	−2.6	0.0
1250.	1249.7	3.4	2.9	1.7	0.1	−1.6	−2.8	−3.2	0.0
1500.	1499.6	4.0	3.5	2.1	0.1	−1.9	−3.4	−3.9	0.0
1750.	1749.5	4.7	4.1	2.4	0.1	−2.2	−3.9	−4.5	0.0
2000.	1999.3	5.4	4.7	2.7	0.1	−2.5	−4.5	−5.2	0.0
2250.	2249.2	6.1	5.3	3.1	0.1	−2.9	−5.0	−5.8	0.0
2500.	2499.0	6.7	5.8	3.4	0.1	−3.2	−5.6	−6.5	0.0
2750.	2748.8	7.4	6.4	3.8	0.1	−3.5	−6.1	−7.1	0.0
3000.	2998.5	8.1	7.0	4.1	0.2	−3.8	−6.7	−7.8	0.0
3250.	3248.3	8.7	7.6	4.5	0.2	−4.1	−7.3	−8.4	0.0
3500.	3498.0	9.4	8.2	4.8	0.2	−4.4	−7.8	−9.1	0.0
3750.	3747.7	10.1	8.8	5.1	0.2	−4.8	−8.4	−9.7	0.0
4000.	3997.4	10.8	9.4	5.5	0.2	−5.1	−8.9	−10.4	0.0
4250.	4247.1	11.4	9.9	5.8	0.2	−5.4	−9.5	−11.0	0.0
4500.	4496.8	12.1	10.5	6.2	0.2	−5.7	−10.1	−11.7	0.0
4750.	4746.4	12.8	11.1	6.5	0.2	−6.0	−10.6	−12.3	0.0
5000.	4996.0	13.5	11.7	6.9	0.3	−6.4	−11.2	−13.0	0.0
5250.	5245.6	14.1	12.3	7.2	0.3	−6.7	−11.7	−13.6	0.0
5500.	5495.2	14.8	12.9	7.5	0.3	−7.0	−12.3	−14.3	0.0
5750.	5744.8	15.5	13.5	7.9	0.3	−7.3	−12.9	−14.9	0.0
6000.	5994.3	16.2	14.0	8.2	0.3	−7.6	−13.4	−15.6	0.0
6250.	6243.8	16.8	14.6	8.6	0.3	−7.9	−14.0	−16.2	0.0
6500.	6493.3	17.5	15.2	8.9	0.3	−8.3	−14.5	−16.9	0.0
6750.	6742.8	18.2	15.8	9.3	0.3	−8.6	−15.1	−17.5	0.0
7000.	6992.3	18.9	16.4	9.6	0.4	−8.9	−15.7	−18.2	0.0
7250.	7241.7	19.5	17.0	10.0	0.4	−9.2	−16.2	−18.8	0.0
7500.	7491.1	20.2	17.6	10.3	0.4	−9.5	−16.8	−19.4	0.0
7750.	7740.5	20.9	18.1	10.6	0.4	−9.9	−17.4	−20.1	0.0
8000.	7989.9	21.6	18.7	11.0	0.4	−10.2	−17.9	−20.8	0.0
8250.	8239.3	22.2	19.3	11.3	0.4	−10.5	−18.5	−21.4	0.0
8500.	8488.6	22.9	19.9	11.7	0.4	−10.8	−19.0	−22.1	0.0
8750.	8737.9	23.6	20.5	12.0	0.4	−11.1	−19.6	−22.7	0.0
9000.	8987.2	24.3	21.1	12.4	0.5	−11.5	−20.2	−23.4	0.0
9250.	9236.5	24.9	21.7	12.7	0.5	−11.8	−20.7	−24.0	0.0
9500.	9485.8	25.6	22.3	13.1	0.5	−12.1	−21.3	−24.7	0.0
9750.	9735.0	26.3	22.8	13.4	0.5	−12.4	−21.8	−25.3	0.0

TABLE 4.20. – Continued

Geometric Altitude Z_g(m)	Geopotential H_g(m')	$Z_\phi - Z_g$(m) Latitude ϕ (Deg)							$Z_s - Z_g$
		0	15	30	45	60	75	90	
10000.	9984.2	27.0	23.4	13.7	0.5	-12.7	-22.4	-26.0	0.0
10250.	10233.4	27.7	24.0	14.1	0.5	-13.1	-23.0	-26.6	0.0
10500.	10482.6	28.3	24.6	14.4	0.5	-13.4	-23.5	-27.3	0.0
10750.	10731.8	29.0	25.2	14.8	0.5	-13.7	-24.1	-27.9	0.0
11000.	10980.9	29.7	25.8	15.1	0.6	-14.0	-24.7	-28.6	0.0
11500.	11479.2	31.0	27.0	15.8	0.6	-14.7	-25.8	-29.9	0.0
12000.	11977.3	32.4	28.1	16.5	0.6	-15.3	-26.9	-31.2	0.0
12500.	12475.4	33.8	29.3	17.2	0.6	-15.9	-28.0	-32.5	0.0
13000.	12973.4	35.1	30.5	17.9	0.7	-16.6	-29.2	-33.8	0.0
13500.	13471.3	36.5	31.7	18.6	0.7	-17.2	-30.3	-35.1	0.0
14000.	13969.2	37.8	32.8	19.3	0.7	-17.9	-31.4	-36.4	0.0
14500.	14467.0	39.2	34.0	20.0	0.7	-18.5	-32.5	-37.7	0.0
15000.	14964.6	40.5	35.2	20.7	0.8	-19.1	-33.7	-39.0	0.0
15500.	15462.2	41.9	36.4	21.3	0.8	-19.8	-34.8	-40.3	0.0
16000.	15959.8	43.3	37.6	22.0	0.8	-20.4	-35.9	-41.6	0.0
16500.	16457.2	44.6	38.7	22.7	0.8	-21.1	-37.1	-42.9	0.0
17000.	16954.6	46.0	39.9	23.4	0.9	-21.7	-38.2	-44.2	0.0
17500.	17451.9	47.3	41.1	24.1	0.9	-22.3	-39.3	-45.5	0.0
18000.	17949.1	48.7	42.3	24.8	0.9	-23.0	-40.5	-46.9	0.0
18500.	18446.3	50.1	43.5	25.5	0.9	-23.6	-41.6	-48.2	0.0
19000.	18943.3	51.4	44.7	26.2	1.0	-24.3	-42.7	-49.5	0.0
19500.	19440.3	52.8	45.8	26.9	1.0	-24.9	-43.9	-50.8	0.0
20000.	19937.2	54.1	47.0	27.6	1.0	-25.6	-45.0	-52.1	0.0
20500.	20434.1	55.5	48.2	28.3	1.0	-26.2	-46.1	-53.4	0.0
21000.	20930.8	56.9	49.4	29.0	1.1	-26.8	-47.3	-54.7	0.0
21500.	21427.5	58.2	50.6	29.7	1.1	-27.5	-48.4	-56.0	0.0
22000.	21924.1	59.6	51.8	30.4	1.1	-28.1	-49.5	-57.3	0.0
22500.	22420.6	61.0	53.0	31.1	1.1	-28.8	-50.7	-58.7	0.0
23000.	22917.0	62.3	54.1	31.8	1.2	-29.4	-51.8	-60.0	0.0
23500.	23413.4	63.7	55.3	32.5	1.2	-30.1	-52.9	-61.3	0.0
24000.	23909.7	65.1	56.5	33.1	1.2	-30.7	-54.1	-62.6	0.0
24500.	24405.9	66.4	57.7	33.8	1.2	-31.4	-55.2	-63.9	0.0
25000.	24902.0	67.8	58.9	34.5	1.3	-32.0	-56.3	-65.2	0.0
25500.	25398.1	69.2	60.1	35.2	1.3	-32.7	-57.5	-66.6	0.0
26000.	25894.0	70.5	61.3	35.9	1.3	-33.3	-58.6	-67.9	0.0
26500.	26389.9	71.9	62.5	36.6	1.3	-33.9	-59.7	-69.2	0.0
27000.	26885.8	73.3	63.6	37.3	1.4	-34.6	-60.9	-70.5	0.0
27500.	27381.5	74.7	64.8	38.0	1.4	-35.2	-62.0	-71.8	0.0
28000.	27877.2	76.0	66.0	38.7	1.4	-35.9	-63.2	-73.1	0.0
28500.	28372.7	77.4	67.2	39.4	1.4	-36.5	-64.3	-74.5	0.0
29000.	28868.3	78.8	68.4	40.1	1.5	-37.2	-65.4	-75.8	0.0
29500.	29363.7	80.1	69.6	40.8	1.5	-37.8	-66.6	-77.1	0.0

TABLE 4.20. – Continued

Geometric Altitude Z_g(m)	Geopotential H_g(m')	$Z_o - Z_g$(m) Latitude ϕ (Deg)							$Z_s - Z_g$
		0	15	30	45	60	75	90	
30000.	29859.0	81.5	70.8	41.5	1.5	-38.5	-67.7	-78.4	0.0
30500.	30354.3	82.9	72.0	42.2	1.5	-39.1	-68.9	-79.7	0.0
31000.	30849.5	84.3	73.2	42.9	1.6	-39.8	-70.0	-81.1	0.0
31500.	31344.6	85.6	74.4	43.6	1.6	-40.4	-71.1	-82.4	0.0
32000.	31839.7	87.0	75.6	44.3	1.6	-41.1	-72.3	-83.7	0.0
33000.	32829.5	89.8	78.0	45.7	1.7	-42.4	-74.6	-86.4	0.0
34000.	33819.1	92.5	80.3	47.1	1.7	-43.7	-76.9	-89.0	0.0
35000.	34808.3	95.3	82.7	48.5	1.8	-45.0	-79.1	-91.7	0.0
36000.	35797.2	98.0	85.1	49.9	1.8	-46.3	-81.4	-94.3	0.0
37000.	36785.8	100.8	87.5	51.3	1.9	-47.6	-83.7	-97.0	0.0
38000.	37774.1	103.5	89.9	52.7	1.9	-48.9	-86.0	-99.6	0.0
39000.	38762.1	106.3	92.3	54.2	2.0	-50.2	-88.3	-102.3	0.0
40000.	39749.8	109.1	94.7	55.6	2.0	-51.5	-90.6	-104.9	0.0
41000.	40737.2	111.8	97.1	57.0	2.1	-52.8	-92.9	-107.6	0.0
42000.	41724.3	114.6	99.5	58.4	2.1	-54.1	-95.2	-110.3	0.0
43000.	42711.0	117.4	101.9	59.8	2.2	-55.4	-97.5	-112.9	0.0
44000.	43697.5	120.1	104.3	61.2	2.2	-56.7	-99.8	-115.6	0.0
45000.	44683.6	122.9	106.8	62.6	2.3	-58.0	-102.1	-118.3	0.0
46000.	45669.5	125.7	109.2	64.0	2.3	-59.3	-104.4	-120.9	0.0
47000.	46655.0	128.5	111.6	65.4	2.4	-60.6	-106.7	-123.6	0.0
48000.	47640.2	131.3	114.0	66.9	2.4	-62.0	-109.0	-126.3	0.1
49000.	48625.1	134.0	116.4	68.3	2.5	-63.3	-111.3	-129.0	0.1
50000.	49609.7	136.8	118.8	69.7	2.5	-64.6	-113.7	-131.6	0.1
51000.	50594.0	139.6	121.2	71.1	2.6	-65.9	-116.0	-134.3	0.1
52000.	51578.0	142.4	123.7	72.5	2.6	-67.2	-118.3	-137.0	0.1
53000.	52561.7	145.2	126.1	74.0	2.7	-68.5	-120.6	-139.7	0.1
54000.	53545.1	148.0	128.5	75.4	2.7	-69.8	-122.9	-142.4	0.1
55000.	54528.2	150.8	130.9	76.8	2.8	-71.2	-125.2	-145.0	0.1
56000.	55510.9	153.6	133.4	78.2	2.9	-72.5	-127.6	-147.7	0.1
57000.	56493.4	156.4	135.8	79.7	2.9	-73.8	-129.9	-150.4	0.1
58000.	57475.5	159.2	138.2	81.1	3.0	-75.1	-132.2	-153.1	0.1
59000.	58457.4	162.0	140.7	82.5	3.0	-76.4	-134.5	-155.8	0.1
60000.	59438.9	164.8	143.1	83.9	3.1	-77.8	-136.9	-158.5	0.1
61000.	60420.2	167.6	145.5	85.4	3.1	-79.1	-139.2	-161.2	0.1
62000.	61401.1	170.4	148.0	86.8	3.2	-80.4	-141.5	-163.9	0.1
63000.	62381.7	173.2	150.4	88.2	3.2	-81.7	-143.9	-166.6	0.1
64000.	63362.0	176.0	152.8	89.7	3.3	-83.1	-146.2	-169.3	0.1
65000.	64342.0	178.8	155.3	91.1	3.3	-84.4	-148.5	-172.0	0.1
66000.	65321.7	181.6	157.7	92.5	3.4	-85.7	-150.9	-174.7	0.1
67000.	66301.1	184.4	160.2	93.9	3.4	-87.1	-153.2	-177.4	0.1
68000.	67280.2	187.3	162.6	95.4	3.5	-88.4	-155.5	-180.1	0.1
69000.	68259.0	190.1	165.1	96.8	3.5	-89.7	-157.9	-182.9	0.1

TABLE 4.20. – Continued

Geometric Altitude Z_g(m)	Geopotential H_g(m')	$Z_\phi - Z_g$(m) Latitude ϕ (Deg)							$Z_s - Z_g$
		0	15	30	45	60	75	90	
70000.	69237.5	192.9	167.5	98.3	3.6	-91.0	-160.2	-185.6	0.1
71000.	70215.7	195.7	170.0	99.7	3.6	-92.4	-162.6	-188.3	0.1
72000.	71193.6	198.6	172.4	101.1	3.7	-93.7	-164.9	-191.0	0.1
73000.	72171.2	201.4	174.9	102.6	3.7	-95.0	-167.3	-193.7	0.1
74000.	73148.4	204.2	177.4	104.0	3.8	-96.4	-169.8	-196.4	0.1
75000.	74125.4	207.0	179.8	105.5	3.8	-97.7	-172.0	-199.2	0.1
76000.	75102.0	209.9	182.3	106.9	3.9	-99.1	-174.3	-201.9	0.1
77000.	76078.4	212.7	184.7	108.4	4.0	-100.4	-176.7	-204.6	0.1
78000.	77054.5	215.6	187.2	109.8	4.0	-101.7	-179.0	-207.4	0.2
79000.	78030.2	218.4	189.7	111.2	4.1	-103.1	-181.4	-210.1	0.2
80000.	79005.7	221.2	192.1	112.7	4.1	-104.4	-183.8	-212.8	0.2
81000.	79980.8	224.1	194.6	114.1	4.2	-105.8	-186.1	-215.6	0.2
82000.	80955.7	226.9	197.1	115.6	4.2	-107.1	-188.5	-218.3	0.2
83000.	81930.2	229.8	199.5	117.0	4.3	-108.5	-190.9	-221.0	0.2
84000.	82904.4	232.6	202.0	118.5	4.3	-109.8	-193.2	-223.8	0.2
85000.	83878.4	235.5	204.5	119.9	4.4	-111.1	-195.6	-226.5	0.2
86000.	84852.0	238.3	207.0	121.4	4.4	-112.5	-198.0	-229.3	0.2
87000.	85825.3	241.2	209.5	122.9	4.5	-113.8	-200.3	-232.0	0.2
88000.	86798.4	244.0	211.9	124.3	4.5	-115.2	-202.7	-234.8	0.2
89000.	87771.1	246.9	214.4	125.8	4.6	-116.5	-205.1	-237.5	0.2
90000.	88743.5	249.8	216.9	127.2	4.6	-117.9	-207.4	-240.3	0.2
92000.	90687.4	255.5	221.9	130.1	4.7	-120.6	-212.2	-245.8	0.2
94000.	92630.2	261.2	226.9	133.1	4.9	-123.3	-217.0	-251.3	0.2
96000.	94571.7	267.0	231.9	136.0	5.0	-126.0	-221.7	-256.8	0.2
98000.	96512.1	272.7	236.9	138.9	5.1	-128.7	-226.5	-262.3	0.3
100000.	98451.2	278.5	241.8	141.8	5.2	-131.4	-231.3	-267.9	0.3
102000.	100389.1	284.3	246.9	144.8	5.3	-134.2	-236.1	-273.4	0.3
104000.	102325.9	290.0	251.9	147.7	5.4	-136.9	-240.9	-279.0	0.3
106000.	104261.4	295.8	256.9	150.7	5.5	-139.6	-245.7	-284.5	0.3
108000.	106195.7	301.6	261.9	153.6	5.6	-142.3	-250.5	-290.1	0.3
110000.	108128.8	307.4	267.0	156.6	5.7	-145.1	-255.3	-295.7	0.3
112000.	110060.8	313.2	272.0	159.5	5.8	-147.8	-260.1	-301.3	0.4
114000.	111991.5	319.0	277.1	162.5	5.9	-150.6	-265.0	-306.8	0.4
116000.	113921.1	324.8	282.1	165.5	6.0	-153.3	-269.8	-312.5	0.4
118000.	115849.5	330.7	287.2	168.4	6.1	-156.1	-274.6	-318.1	0.4
120000.	117776.6	336.5	292.2	171.4	6.3	-158.8	-279.5	-323.7	0.4
125000.	122589.3	351.1	304.9	178.9	6.5	-165.7	-291.6	-337.7	0.5
130000.	127394.6	365.8	317.7	186.3	6.8	-172.6	-303.8	-351.9	0.5
135000.	132192.6	380.5	330.5	193.8	7.1	-179.6	-316.0	-366.0	0.6
140000.	136983.1	395.3	343.3	201.3	7.3	-186.6	-328.3	-380.2	0.6
145000.	141766.2	410.1	356.2	208.9	7.6	-193.5	-340.6	-394.4	0.7
150000.	146542.0	425.0	369.1	216.5	7.9	-200.6	-352.9	-408.7	0.7
155000.	151310.5	439.9	382.0	224.1	8.2	-207.6	-365.3	-423.1	0.8
160000.	156071.6	454.9	395.0	231.7	8.5	-214.6	-377.7	-437.5	0.8
165000.	160825.5	469.9	408.1	239.3	8.7	-221.7	-390.2	-451.9	0.9

TABLE 4 20. – Continued

Geometric Altitude Z_g(km)	Geopotential H_g(m')	$Z_\phi - Z_g$(m) Latitude ϕ (Deg)							$Z_s - Z_g$
		0	15	30	45	60	75	90	
170.	165572.0	484.9	421.1	247.0	9.0	-228.9	-402.7	-466.4	1.0
175.	170311.3	500.1	434.3	254.7	9.3	-236.0	-415.2	-480.9	1.0
180.	175043.4	515.2	447.4	262.4	9.6	-243.1	-427.8	-495.5	1.1
185.	179768.2	530.4	460.6	270.2	9.9	-250.3	-440.4	-510.1	1.2
190.	184485.8	545.7	473.9	277.9	10.2	-257.5	-453.1	-524.7	1.3
195.	189196.2	561.0	487.2	285.7	10.4	-264.7	-465.8	-539.5	1.4
200.	193899.4	576.3	500.5	293.6	10.7	-271.9	-478.5	-554.2	1.5
205.	198595.4	591.7	513.9	301.4	11.0	-279.2	-491.3	-569.0	1.6
210.	203284.3	607.2	527.3	309.3	11.3	-286.5	-504.2	-583.9	1.7
215.	207966.1	622.7	540.8	317.2	11.6	-293.8	-517.0	-598.7	1.8
220.	212640.7	638.2	554.3	325.1	11.9	-301.1	-529.9	-613.7	1.9
225.	217308.2	653.8	567.8	333.0	12.1	-308.5	-542.9	-628.7	2.0
230.	221968.7	669.5	581.4	341.0	12.5	-315.9	-555.8	-643.7	2.1
235.	226622.1	685.1	595.0	349.0	12.7	-323.3	-568.9	-658.8	2.2
240.	231268.4	700.9	608.7	357.0	13.0	-330.7	-581.9	-673.9	2.3
245.	235907.7	716.7	622.4	365.0	13.3	-338.1	-595.0	-689.1	2.4
250.	240539.9	732.5	636.1	373.1	13.6	-345.6	-608.2	-704.3	2.6
255.	245165.2	748.4	650.0	381.2	13.9	-353.1	-621.3	-719.5	2.7
260.	249783.5	764.3	663.8	389.3	14.2	-360.6	-634.6	-734.9	2.8
265.	254394.8	780.3	677.6	397.4	14.5	-368.2	-647.8	-750.2	3.0
270.	258999.1	796.3	691.6	405.6	14.8	-375.7	-661.1	-765.6	3.1
275.	263596.5	812.4	705.5	413.8	15.1	-383.3	-674.5	-781.1	3.3
280.	268187.0	828.5	719.5	422.0	15.4	-390.9	-687.9	-796.6	3.5
285.	272770.5	844.7	733.6	430.2	15.7	-398.5	-701.2	-812.1	3.6
290.	277347.2	860.9	747.7	438.5	16.0	-406.2	-714.7	-827.7	3.8
295.	281917.0	877.2	761.8	446.8	16.3	-413.8	-728.2	-843.3	4.0
300.	286479.9	893.5	776.0	455.1	16.6	-421.5	-741.7	-859.0	4.1
310.	295585.2	926.3	804.4	471.8	17.2	-437.0	-768.9	-890.5	4.5
320.	304663.2	959.3	833.1	488.6	17.8	-452.6	-796.3	-922.2	4.9
330.	313714.0	992.5	861.9	505.5	18.4	-468.2	-823.8	-954.1	5.3
340.	322737.9	1025.9	890.9	522.5	19.1	-483.9	-851.5	-986.1	5.7
350.	331734.8	1059.4	920.0	539.6	19.7	-499.7	-879.3	-1018.3	6.2
360.	340704.9	1093.2	949.3	556.7	20.3	-515.7	-907.3	-1050.8	6.7
370.	349648.4	1127.1	978.8	574.0	20.9	-531.6	-935.5	-1083.4	7.2
380.	358565.3	1161.3	1008.5	591.4	21.6	-547.7	-963.8	-1116.1	7.7
390.	367455.8	1195.6	1038.2	608.9	22.2	-564.0	-992.3	-1149.1	8.3
400.	376320.0	1230.1	1068.2	626.4	22.8	-580.2	-1020.9	-1182.3	8.9
410.	385158.0	1264.9	1098.4	644.1	23.5	-596.6	-1049.7	-1215.6	9.5
420.	393969.9	1299.8	1128.7	661.9	24.2	-613.0	-1078.6	-1249.1	10.1
430.	402755.7	1334.9	1159.2	679.8	24.8	-629.6	-1107.8	-1282.9	10.8
440.	411515.8	1370.2	1189.9	697.8	25.5	-646.2	-1137.0	-1316.7	11.4
450.	420250.1	1405.7	1220.7	715.8	26.1	-663.0	-1166.4	-1350.8	12.2
460.	428958.9	1441.4	1251.7	734.0	26.8	-679.7	-1196.0	-1385.0	12.9
470.	437642.0	1477.2	1282.8	752.3	27.4	-696.7	-1225.8	-1419.5	13.7
480.	446299.8	1513.3	1314.2	770.6	28.1	-713.7	-1255.7	-1454.1	14.5
490.	454932.3	1549.6	1345.7	789.1	28.8	-730.8	-1285.7	-1488.9	15.3

TABLE 4.20. – Continued

Geometric Altitude Z_g(km)	Geopotential H_g(m')	$Z_\phi - Z_g$(m) Latitude ϕ (Deg 0	15	30	45	60	75	90	$Z_s - Z_g$
500.	463539.6	1586.1	1377.4	807.7	29.5	-747.9	-1316.0	-1523.9	16.2
510.	472121.8	1622.7	1409.2	826.3	30.1	-765.2	-1346.4	-1559.2	17.1
520.	480679.1	1659.6	1441.2	845.1	30.8	-782.6	-1376.9	-1594.5	18.0
530.	489211.6	1696.7	1473.4	864.0	31.5	-800.0	-1407.6	-1630.1	19.0
540.	497719.2	1733.9	1505.7	882.9	32.2	-817.6	-1438.5	-1665.8	20.0
550.	506202.3	1771.3	1538.2	902.0	32.9	-835.2	-1469.5	-1701.7	21.0
560.	514660.8	1809.0	1570.9	921.1	33.6	-853.0	-1500.7	-1737.8	22.1
570.	523095.0	1846.8	1603.7	940.4	34.3	-870.8	-1532.0	-1774.1	23.2
580.	531504.7	1884.8	1636.7	959.7	35.0	-888.7	-1563.5	-1810.6	24.3
590.	539890.3	1923.0	1669.9	979.2	35.7	-906.7	-1595.2	-1847.3	25.5
600.	548251.8	1961.4	1703.2	998.7	36.4	-924.8	-1627.0	-1884.1	26.7
610.	556589.3	2000.1	1736.8	1018.4	37.2	-942.9	-1658.9	-1921.1	28.0
620.	564902.8	2038.8	1770.5	1038.1	37.8	-961.3	-1691.1	-1958.4	29.3
630.	573192.6	2077.8	1804.3	1058.0	38.6	-979.6	-1723.4	-1995.7	30.6
640.	581458.6	2117.0	1838.4	1077.9	39.3	-998.0	-1755.8	-2033.3	32.0
650.	589701.1	2156.3	1872.5	1097.9	40.0	-1016.6	-1788.5	-2071.1	33.4
660.	597920.1	2195.9	1906.9	1118.1	40.8	-1035.2	-1821.3	-2109.1	34.8
670.	606115.7	2235.7	1941.4	1138.3	41.5	-1054.0	-1854.2	-2147.2	36.3
680.	614288.0	2275.7	1976.1	1158.7	42.3	-1072.8	-1887.3	-2185.5	37.8
690.	622437.0	2315.8	2011.0	1179.1	43.0	-1091.7	-1920.6	-2224.0	39.4
700.	630563.0	2356.2	2046.0	1199.7	43.7	-1110.7	-1954.0	-2262.7	41.0
710.	638666.1	2396.7	2081.2	1220.3	44.5	-1129.8	-1987.5	-2301.6	
720.	646746.2	2437.5	2116.6	1241.1	45.3	-1148.9	-2021.2	-2340.6	
730.	654803.4	2478.4	2152.1	1261.8	46.0	-1168.2	-2055.2	-2379.9	
740.	662838.0	2519.5	2187.8	1282.8	46.8	-1187.6	-2089.2	-2419.3	
750.	670850.0	2560.8	2223.7	1303.8	47.6	-1207.0	-2123.4	-2458.9	
760.	678839.5	2602.4	2259.8	1325.0	48.4	-1226.5	-2157.7	-2498.6	
770.	686806.5	2644.0	2296.0	1346.2	49.1	-1246.2	-2192.3	-2538.7	
780.	694751.3	2685.9	2332.3	1367.5	49.9	-1265.9	-2227.0	-2578.8	
790.	702673.8	2728.0	2368.9	1388.9	50.7	-1285.7	-2261.8	-2619.2	
800.	710574.1	2770.3	2405.6	1410.4	51.4	-1305.7	-2296.9	-2659.7	
820.	726308.7	2855.5	2479.6	1453.8	53.0	-1345.7	-2367.3	-2741.3	
840.	741955.9	2941.3	2554.1	1497.5	54.6	-1386.2	-2438.5	-2823.7	
860.	757516.4	3028.1	2629.4	1541.6	56.2	-1427.0	-2510.2	-2906.7	
880.	772990.8	3115.6	2705.4	1586.1	57.8	-1468.2	-2582.6	-2990.6	
900.	788380.0	3203.9	2782.0	1631.1	59.5	-1509.7	-2655.6	-3075.1	
920.	803684.5	3292.9	2859.3	1676.3	61.1	-1551.6	-2729.3	-3160.5	
940.	818905.2	3382.7	2937.3	1722.1	62.8	-1593.8	-2803.6	-3246.4	
960.	834042.7	3473.3	3015.9	1768.1	64.5	-1636.5	-2878.6	-3333.3	
980.	849097.6	3564.7	3095.3	1814.7	66.2	-1679.4	-2954.1	-3420.7	
1000.	864070.7	3656.7	3175.2	1861.5	67.8	-1722.8	-3030.4	-3509.0	

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PART 5

Tables of Properties of Supplementary Atmospheres to 120 Kilometers

Table 5.1

Sea level to 120 km

TEMPERATURE, PRESSURE, DENSITY, SOUND SPEED, COEFFICIENT OF VISCOSITY AND THERMAL CONDUCTIVITY

Metric Units

TABLE 5.1.
15° N. Annual
GEOPOTENTIAL ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, m	Z, m	T, °K	t, °C	$T-T_{ms}$	P, mb	$\frac{P}{P_{ms}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{ms}}$	C, m sec^{-1}	μ, kg m^{-1} sec^{-1}	k, k-cal m^{-1} sec^{-1} (°K)$^{-1}$
0	0	302.59	29.44	14.44	1.01325 + 3	1.000	1.167 + 0	0.952	348.7	1.858 − 5	6.322 − 6
250	251	300.91	27.76	14.39	9.850 + 2	1.001	1.140	0.953	347.7	1.850	6.291
500	501	299.24	26.09	14.34	9.573	1.003	1.115	0.955	346.8	1.842	6.260
750	752	297.57	24.42	14.29	9.303	1.004	1.089	0.956	345.8	1.834	6.229
1000	1002	295.89	22.74	14.24	9.039	1.006	1.064	0.957	344.8	1.827	6.198
1250	1253	294.25	21.10	14.23	8.781	1.007	1.040	0.958	343.9	1.819	6.167
1500	1504	292.61	19.46	14.21	8.529	1.009	1.015	0.960	342.9	1.811	6.137
1750	1755	290.98	17.83	14.20	8.283	1.010	9.917 − 1	0.961	342.0	1.803	6.106
2000	2005	289.34	16.19	14.19	8.043	1.012	9.684	0.963	341.0	1.795	6.075
2250	2256	287.72	14.57	14.19	7.809	1.013	9.455	0.963	340.0	1.787	6.045
2500	2507	287.74	14.59	15.84	7.580 + 2	1.015	9.177 − 1	0.959	340.1	1.787 − 5	6.045 − 6
2750	2758	286.01	12.86	15.74	7.353	1.017	8.962	0.961	339.0	1.779	6.013
3000	3008	284.28	11.13	15.63	7.141	1.019	8.750	0.963	338.0	1.771	5.980
3250	3259	282.55	9.40	15.53	6.929	1.020	8.543	0.964	337.0	1.762	5.948
3500	3510	280.82	7.67	15.42	6.722	1.022	8.339	0.966	335.9	1.754	5.915
3750	3761	279.09	5.94	15.32	6.520	1.024	8.138	0.968	334.9	1.745	5.882
4000	4012	277.36	4.21	15.21	6.323	1.026	7.941	0.970	333.9	1.737	5.849
4250	4263	275.66	2.51	15.13	6.130	1.028	7.748	0.971	332.8	1.728	5.817
4500	4514	273.95	0.80	15.05	5.943	1.029	7.557	0.973	331.8	1.720	5.784
4750	4765	272.24	−0.91	14.97	5.760	1.031	7.370	0.975	330.8	1.712	5.752
5000	5016	270.54	−2.61	14.89	5.581 + 2	1.033	7.187 − 1	0.976	329.7	1.703 − 5	5.719 − 6
5250	5267	268.83	−4.32	14.80	5.407	1.035	7.007	0.978	328.7	1.695	5.687
5500	5518	267.12	−6.03	14.72	5.238	1.037	6.831	0.980	327.6	1.686	5.654
5750	5769	265.42	−7.73	14.64	5.072	1.039	6.658	0.982	326.6	1.678	5.621
6000	6020	263.71	−9.44	14.56	4.911	1.041	6.488	0.983	325.5	1.669	5.588
6250	6271	262.02	−11.13	14.49	4.754	1.043	6.321	0.985	324.5	1.660	5.556
6500	6522	260.32	−12.83	14.42	4.601	1.045	6.158	0.987	323.4	1.652	5.523
6750	6773	258.63	−14.52	14.36	4.452	1.047	5.997	0.989	322.4	1.643	5.490
7000	7024	256.94	−16.21	14.29	4.307	1.049	5.840	0.991	321.3	1.635	5.458
7250	7275	255.25	−17.90	14.22	4.166	1.051	5.686	0.992	320.3	1.626	5.425
7500	7526	253.56	−19.59	14.16	4.028 + 2	1.053	5.535 − 1	0.994	319.2	1.617 − 5	5.392 − 6
7750	7778	251.86	−21.29	14.09	3.895	1.055	5.387	0.996	318.1	1.609	5.359
8000	8029	250.17	−22.98	14.02	3.764	1.057	5.242	0.998	317.1	1.600	5.326
8250	8280	248.49	−24.66	13.97	3.638	1.060	5.100	1.000	316.0	1.591	5.293
8500	8531	246.81	−26.34	13.91	3.514	1.062	4.960	1.002	314.9	1.583	5.260
8750	8783	245.13	−28.02	13.85	3.394	1.064	4.824	1.004	313.9	1.574	5.227
9000	9034	243.44	−29.71	13.79	3.278	1.066	4.690	1.006	312.8	1.565	5.194
9250	9285	241.76	−31.39	13.74	3.164	1.068	4.560	1.008	311.7	1.556	5.161
9500	9537	240.08	−33.07	13.68	3.054	1.071	4.432	1.010	310.6	1.547	5.128
9750	9788	238.40	−34.75	13.62	2.947	1.073	4.306	1.012	309.5	1.539	5.095
10000	10039	236.72	−36.43	13.57	2.843 + 2	1.075	4.184 − 1	1.014	308.4	1.530 − 5	5.062 − 6
10250	10291	235.04	−38.11	13.51	2.742	1.078	4.064	1.016	307.3	1.521	5.029
10500	10542	233.36	−39.79	13.46	2.644	1.080	3.946	1.018	306.2	1.512	4.995
10750	10793	231.68	−41.47	13.40	2.548	1.083	3.832	1.020	305.1	1.503	4.962
11000	11045	230.00	−43.15	13.35	2.456	1.085	3.720	1.022	304.0	1.494	4.929
11500	11548	226.65	−46.50	10.00	2.279	1.089	3.502	1.041	301.8	1.476	4.862
12000	12051	223.30	−49.85	6.65	2.112	1.093	3.295	1.060	299.6	1.458	4.795
12500	12554	219.95	−53.20	3.30	1.955	1.095	3.097	1.078	297.3	1.440	4.728
13000	13057	216.60	−56.55	−0.05	1.808	1.095	2.908	1.095	295.0	1.421	4.661
13500	13560	213.25	−59.90	−3.40	1.670	1.094	2.728	1.112	292.7	1.403	4.593
14000	14064	209.90	−63.25	−6.75	1.541 + 2	1.093	2.557 − 1	1.127	290.4	1.384 − 5	4.525 − 6
14500	14567	206.55	−66.60	−10.10	1.419	1.089	2.394	1.142	288.1	1.366	4.457
15000	15071	203.20	−69.95	−13.45	1.306	1.084	2.238	1.156	285.8	1.347	4.389
15500	15574	199.85	−73.30	−16.80	1.200	1.078	2.091	1.168	283.4	1.328	4.321
16000	16078	196.50	−76.65	−20.15	1.100	1.069	1.951	1.180	281.0	1.309	4.252
16500	16582	193.15	−80.00	−23.50	1.008	1.060	1.818	1.189	278.6	1.289	4.184
17000	17086	193.15	−78.00	−21.50	9.232 + 1	1.051	1.668	1.166	280.0	1.301	4.225
17500	17590	197.15	−76.00	−19.50	8.462	1.042	1.495	1.145	281.5	1.312	4.266
18000	18094	199.15	−74.00	−17.50	7.763	1.034	1.358	1.125	282.9	1.324	4.307
18500	18598	201.15	−72.00	−15.50	7.128	1.028	1.234	1.107	284.3	1.335	4.347
19000	19102	203.15	−70.00	−13.50	6.550 + 1	1.022	1.123 − 1	1.090	285.7	1.346 − 5	4.388 − 6
19500	19606	205.15	−68.00	−11.50	6.025	1.017	1.023	1.074	287.1	1.358	4.429
20000	20110	207.15	−66.00	−9.50	5.546	1.013	9.326 − 2	1.059	288.5	1.369	4.470
20500	20615	209.15	−64.00	−8.00	5.109	1.010	8.509	1.048	289.9	1.380	4.510
21000	21119	211.15	−62.00	−6.50	4.710	1.007	7.771	1.038	291.3	1.391	4.551
21500	21624	213.15	−60.00	−5.00	4.345	1.005	7.102	1.028	292.7	1.402	4.591
22000	22128	215.15	−58.00	−3.50	4.012	1.003	6.497	1.019	294.0	1.413	4.631
22500	22633	216.25	−56.90	−2.90	3.707	1.002	5.972	1.015	294.8	1.419	4.654
23000	23138	217.35	−55.80	−2.30	3.426	1.001	5.491	1.012	295.5	1.425	4.676
23500	23643	218.45	−54.70	−1.70	3.168	1.000	5.052	1.008	296.3	1.431	4.698
24000	24148	219.55	−53.60	−1.10	2.930 + 1	1.000	4.649 − 2	1.005	297.0	1.438 − 5	4.720 − 6
24500	24653	220.65	−52.50	−0.50	2.711	1.000	4.280	1.002	297.8	1.444	4.742
25000	25158	221.75	−51.40	0.10	2.510	0.999	3.943	0.999	298.5	1.449	4.764
25500	25663	222.85	−50.30	0.70	2.324	1.000	3.633	0.996	299.3	1.455	4.786
26000	26168	223.95	−49.20	1.30	2.153	1.000	3.349	0.994	300.0	1.461	4.808
26500	26674	225.05	−48.10	1.90	1.995	1.001	3.089	0.992	300.7	1.467	4.830
27000	27179	226.15	−47.00	2.50	1.850	1.001	2.849	0.990	301.5	1.473	4.852
27500	27685	227.25	−45.90	3.10	1.715	1.002	2.630	0.989	302.2	1.479	4.874
28000	28190	228.35	−44.80	3.70	1.592	1.004	2.428	0.987	302.9	1.485	4.896
28500	28696	229.45	−43.70	4.30	1.477	1.005	2.243	0.986	303.7	1.491	4.918

TABLE 5.1.
15° N. Annual
GEOMETRIC ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, m	H, m	T, °K	t, °C	$T-T_{std}$	P, mb	$\frac{P}{P_{std}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{std}}$	C_s, m sec^{-1}	μ, kg m^{-1} sec^{-1}	k, kcal m^{-1} sec^{-1}(°K)$^{-1}$
0	0	302.59	29.44	14.44	1.01325 + 3	1.000	1.167 + 0	0.952	348.7	1.858 − 5	6.322 − 6
250	249	300.92	27.77	14.39	9.850 + 2	1.001	1.140	0.953	347.8	1.850	6.291
500	499	299.25	26.10	14.35	9.575	1.003	1.115	0.955	346.8	1.842	6.260
750	748	297.58	24.43	14.30	9.305	1.005	1.089	0.956	345.8	1.835	6.229
1000	998	295.91	22.76	14.26	9.042	1.006	1.064	0.957	344.8	1.827	6.198
1250	1247	294.27	21.12	14.25	8.785	1.008	1.040	0.958	343.9	1.819	6.166
1500	1496	292.64	19.49	14.24	8.533	1.009	1.016	0.960	342.9	1.811	6.137
1750	1745	291.01	17.86	14.23	8.288	1.011	9.922 − 1	0.961	342.0	1.803	6.107
2000	1995	289.37	16.22	14.22	8.048	1.012	9.689	0.962	341.0	1.795	6.076
2250	2244	287.76	14.61	14.23	7.814	1.014	9.460	0.964	340.1	1.787	6.046
2500	2493	287.74	14.59	15.84	7.586 + 2	1.016	9.185 − 1	0.960	340.1	1.787 − 5	6.045 − 6
2750	2742	286.07	12.92	15.78	7.364	1.017	8.968	0.961	339.1	1.779	6.014
3000	2992	284.34	11.19	15.68	7.148	1.019	8.757	0.963	338.0	1.771	5.981
3250	3241	282.62	9.47	15.58	6.936	1.021	8.550	0.965	337.0	1.763	5.949
3500	3490	280.89	7.74	15.48	6.730	1.023	8.347	0.967	336.0	1.754	5.916
3750	3739	279.17	6.02	15.38	6.529	1.025	8.147	0.968	334.9	1.746	5.884
4000	3988	277.44	4.29	15.28	6.332	1.027	7.951	0.970	333.9	1.737	5.851
4250	4237	275.74	2.59	15.20	6.140	1.029	7.757	0.972	332.9	1.729	5.819
4500	4486	274.04	0.89	15.12	5.953	1.031	7.567	0.974	331.9	1.720	5.786
4750	4735	272.34	−0.81	15.04	5.770	1.033	7.381	0.976	330.8	1.712	5.754
5000	4984	270.64	−2.51	14.97	5.592 + 2	1.035	7.198 − 1	0.978	329.8	1.704 − 5	5.721 − 6
5250	5233	268.94	−4.21	14.89	5.419	1.037	7.019	0.979	328.8	1.695	5.689
5500	5482	267.24	−5.91	14.81	5.250	1.039	6.843	0.981	327.7	1.687	5.656
5750	5731	265.54	−7.61	14.73	5.085	1.041	6.671	0.983	326.7	1.678	5.624
6000	5980	263.84	−9.31	14.66	4.924	1.043	6.501	0.985	325.6	1.670	5.591
6250	6229	262.16	−10.99	14.59	4.767	1.045	6.335	0.987	324.6	1.661	5.558
6500	6478	260.47	−12.68	14.53	4.614	1.047	6.172	0.989	323.5	1.653	5.526
6750	6727	258.79	−14.36	14.47	4.466	1.049	6.012	0.990	322.5	1.644	5.493
7000	6976	257.10	−16.05	14.40	4.321	1.051	5.855	0.992	321.4	1.636	5.461
7250	7225	255.42	−17.73	14.34	4.180	1.053	5.701	0.994	320.4	1.627	5.428
7500	7474	253.73	−19.42	14.28	4.043 + 2	1.056	5.551 − 1	0.996	319.3	1.618 − 5	5.395 − 6
7750	7723	252.05	−21.10	14.21	3.909	1.058	5.403	0.998	318.3	1.610	5.363
8000	7971	250.37	−22.78	14.15	3.779	1.060	5.258	1.000	317.2	1.601	5.330
8250	8220	248.69	−24.46	14.10	3.652	1.062	5.116	1.002	316.1	1.592	5.297
8500	8469	247.02	−26.13	14.04	3.529	1.065	4.977	1.004	315.1	1.584	5.264
8750	8718	245.34	−27.81	13.99	3.410	1.067	4.841	1.006	314.0	1.575	5.232
9000	8966	243.67	−29.48	13.94	3.293	1.069	4.708	1.008	312.9	1.566	5.199
9250	9215	242.00	−31.15	13.89	3.180	1.071	4.578	1.010	311.9	1.558	5.166
9500	9464	240.32	−32.83	13.83	3.070	1.074	4.450	1.012	310.8	1.549	5.133
9750	9712	238.65	−34.50	13.78	2.963	1.076	4.325	1.014	309.7	1.540	5.100
10000	9961	236.98	−36.17	13.73	2.859 + 2	1.079	4.203 − 1	1.016	308.6	1.531 − 5	5.067 − 6
10250	10210	235.31	−37.84	13.68	2.758	1.082	4.083	1.018	307.5	1.522	5.034
10500	10458	233.64	−39.51	13.63	2.660	1.084	3.966	1.021	306.4	1.513	5.001
10750	10707	231.97	−41.18	13.58	2.565	1.087	3.851	1.023	305.3	1.505	4.968
11000	10955	230.30	−42.85	13.53	2.472	1.089	3.739	1.025	304.2	1.496	4.935
11500	11452	226.97	−46.18	10.32	2.295	1.094	3.523	1.044	302.0	1.478	4.868
12000	11949	223.64	−49.51	6.99	2.128	1.097	3.316	1.063	299.8	1.460	4.802
12500	12446	220.31	−52.84	3.66	1.972	1.100	3.118	1.081	297.6	1.442	4.735
13000	12943	216.98	−56.17	0.33	1.824	1.100	2.929	1.099	295.3	1.423	4.668
13500	13440	213.65	−59.50	−3.00	1.686	1.100	2.749	1.115	293.0	1.405	4.601
14000	13937	210.32	−62.83	−6.33	1.556 + 2	1.098	2.578 − 1	1.131	290.7	1.387 − 5	4.534 − 6
14500	14433	207.00	−66.15	−9.65	1.435	1.095	2.415	1.147	288.4	1.368	4.467
15000	14930	203.67	−69.48	−12.98	1.321	1.091	2.260	1.160	286.1	1.349	4.399
15500	15426	200.34	−72.81	−16.31	1.215	1.085	2.112	1.173	283.7	1.331	4.331
16000	15923	197.02	−76.13	−19.63	1.115	1.078	1.972	1.185	281.4	1.312	4.263
16500	16419	193.69	−79.46	−22.96	1.023	1.068	1.839	1.195	279.0	1.292	4.195
17000	16915	194.81	−78.34	−21.84	9.370 + 1	1.059	1.676	1.178	279.8	1.299	4.218
17500	17411	196.79	−76.36	−19.86	8.593	1.050	1.521	1.156	281.2	1.310	4.258
18000	17907	198.78	−74.37	−17.87	7.888	1.043	1.382	1.137	282.6	1.322	4.299
18500	18403	200.76	−72.39	−15.89	7.246	1.036	1.257	1.118	284.0	1.333	4.340
19000	18899	202.75	−70.40	−13.90	6.663 + 1	1.030	1.145 − 1	1.101	285.4	1.344 − 5	4.380 − 6
19500	19395	204.73	−68.42	−11.92	6.131	1.025	1.043	1.085	286.8	1.355	4.420
20000	19891	206.71	−66.44	−9.94	5.647	1.021	9.516 − 2	1.070	288.2	1.366	4.461
20500	20386	208.69	−64.46	−8.39	5.204	1.018	8.688	1.059	289.6	1.378	4.501
21000	20882	210.68	−62.47	−6.90	4.801	1.015	7.938	1.048	291.0	1.389	4.541
21500	21377	212.66	−60.49	−5.42	4.432	1.013	7.260	1.039	292.3	1.400	4.581
22000	21873	214.64	−58.51	−3.93	4.094	1.012	6.645	1.030	293.7	1.411	4.621
22500	22368	215.96	−57.19	−3.11	3.785	1.010	6.105	1.025	294.6	1.418	4.648
23000	22863	217.05	−56.10	−2.52	3.500	1.010	5.618	1.021	295.3	1.424	4.670
23500	23359	218.14	−55.01	−1.92	3.238	1.009	5.172	1.018	296.1	1.430	4.692
24000	23854	219.23	−53.92	−1.33	2.997 + 1	1.009	4.763 − 2	1.015	296.8	1.436 − 5	4.714 − 6
24500	24349	220.32	−52.83	−0.74	2.775	1.009	4.389	1.012	297.6	1.442	4.735
25000	24844	221.41	−51.74	−0.15	2.571	1.009	4.045	1.009	298.3	1.448	4.757
25500	25339	222.49	−50.66	0.45	2.382	1.009	3.730	1.007	299.0	1.454	4.779
26000	25833	223.58	−49.57	1.04	2.208	1.009	3.441	1.004	299.8	1.459	4.801
26500	26328	224.67	−48.48	1.63	2.048	1.010	3.176	1.002	300.5	1.465	4.823
27000	26823	225.76	−47.39	2.22	1.900	1.011	2.932	1.001	301.2	1.471	4.844
27500	27317	226.85	−46.30	2.82	1.763	1.012	2.708	0.999	301.9	1.477	4.866
28000	27812	227.94	−45.21	3.41	1.637	1.013	2.502	0.998	302.7	1.483	4.888
28500	28306	229.02	−44.13	4.00	1.520	1.014	2.313	0.996	303.4	1.489	4.909

TABLE 5.1.—*Continued*
15° N. Annual
GEOPOTENTIAL ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, m'	Z, m	T, °K	t, °C	$T-T_{std}$	P, mb	$\frac{P}{P_{std}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{std}}$	C, m sec^{-1}	μ, kg m^{-1} sec^{-1}	k, k-cal m^{-1} sec^{-1} (°K)$^{-1}$
29000	29202	230.35	−42.80	4.90	1.371 + 1	1.006	2.072 − 2	0.985	304.4	1.497 − 5	4.940 − 6
29500	29707	231.65	−41.50	5.50	1.274	1.008	1.915	0.984	305.1	1.503	4.962
30000	30213	232.75	−40.40	6.10	1.183	1.010	1.771	0.983	305.8	1.509	4.983
30500	30719	233.85	−39.30	6.70	1.100	1.012	1.636	0.983	306.6	1.515	5.005
31000	31225	234.95	−38.20	7.30	1.023	1.014	1.514	0.983	307.3	1.520	5.027
31500	31732	236.05	−37.10	7.90	9.510 + 0	1.017	1.403	0.983	308.0	1.526	5.049
32000	32238	237.15	−36.00	8.50	8.847	1.019	1.300	0.983	308.7	1.532	5.070
32500	32751	238.35	−34.80	7.90	7.865	1.025	1.114	0.991	310.1	1.544	5.114
34000	34264	241.55	−31.60	7.30	6.650	1.029	9.591 − 3	0.998	311.6	1.555	5.157
35000	35277	243.75	−29.40	6.70	5.777	1.034	8.256	1.005	313.0	1.567	5.200
36000	36291	245.95	−27.20	6.10	5.024 + 0	1.037	7.117 − 3	1.012	314.4	1.578 − 5	5.244 − 6
37000	37305	248.15	−25.00	5.50	4.376	1.041	6.143	1.018	315.8	1.590	5.287
38000	38319	250.35	−22.80	4.90	3.815	1.044	5.309	1.023	317.2	1.601	5.329
39000	39334	252.55	−20.60	4.30	3.330	1.047	4.594	1.029	318.6	1.612	5.372
40000	40349	254.75	−18.40	3.70	2.911	1.049	3.980	1.034	320.0	1.624	5.415
41000	41364	256.95	−16.20	3.10	2.547	1.051	3.453	1.038	321.3	1.635	5.458
42000	42380	259.15	−14.00	2.50	2.231	1.052	2.999	1.042	322.7	1.646	5.500
43000	43395	261.35	−11.80	1.90	1.957	1.054	2.608	1.046	324.1	1.657	5.543
44000	44412	263.55	−9.60	1.30	1.718	1.055	2.271	1.049	325.4	1.668	5.585
45000	45428	265.75	−7.40	0.70	1.510	1.055	1.979	1.052	326.8	1.679	5.627
46000	46445	267.95	−5.20	0.10	1.328 + 0	1.055	1.727 − 3	1.054	328.1	1.690 − 5	5.670 − 6
47500	47463	270.15	−3.00	−0.50	1.170	1.055	1.509	1.056	329.5	1.701	5.712
48000	48480	270.15	−3.00	−0.50	1.031	1.055	1.329	1.057	329.5	1.701	5.712
49000	49498	270.15	−3.00	−0.50	9.085 − 1	1.054	1.172	1.056	329.5	1.701	5.712
50000	50516	270.15	−3.00	−0.50	8.006	1.054	1.032	1.056	329.5	1.701	5.712
51000	51535	270.15	−3.00	−0.50	7.053	1.054	9.097 − 4	1.056	329.5	1.701	5.712
52000	52554	268.15	−5.00	−2.50	6.214	1.053	8.073	1.063	328.3	1.691	5.674
53000	53573	266.15	−7.00	−2.50	5.468	1.052	7.157	1.062	327.0	1.681	5.635
54000	54592	264.15	−9.00	−2.50	4.807	1.051	6.339	1.061	325.8	1.671	5.597
55000	55612	262.15	−11.00	−2.50	4.222	1.049	5.610	1.059	324.6	1.661	5.558
56000	56632	260.15	−13.00	−2.50	3.704 − 1	1.048	4.960 − 4	1.058	323.3	1.651 − 5	5.520 − 6
57000	57653	258.15	−15.00	−2.50	3.246	1.047	4.381	1.057	322.1	1.641	5.481
58000	58674	256.15	−17.00	−2.50	2.843	1.045	3.866	1.056	320.8	1.631	5.442
59000	59695	254.15	−19.00	−2.50	2.486	1.044	3.408	1.054	319.6	1.620	5.403
60000	60716	250.65	−22.50	−4.00	2.172	1.042	3.018	1.059	317.4	1.602	5.335
61000	61738	247.15	−26.00	−5.50	1.893	1.040	2.668	1.063	315.2	1.584	5.267
62000	62760	243.65	−29.50	−5.00	1.647	1.037	2.355	1.058	312.9	1.566	5.198
63000	63783	240.15	−33.00	−4.50	1.430	1.034	2.075	1.053	310.7	1.548	5.130
64000	64805	236.65	−36.50	−4.00	1.239	1.031	1.824	1.048	308.4	1.529	5.061
65000	65828	233.15	−40.00	−3.50	1.071	1.029	1.601	1.044	306.1	1.511	4.991
66000	66852	229.65	−43.50	−3.00	9.244 − 2	1.027	1.402 − 4	1.040	303.8	1.492 − 5	4.922 − 6
67000	67876	226.15	−47.00	−2.50	7.957	1.025	1.226	1.036	301.5	1.473	4.852
68000	68900	222.65	−50.50	−2.00	6.833	1.023	1.069	1.032	299.1	1.454	4.782
69000	69924	219.15	−54.00	−1.50	5.854	1.022	9.306 − 5	1.029	296.8	1.435	4.712
70000	70949	215.65	−57.50	−1.00	5.003	1.021	8.082	1.026	294.4	1.416	4.642
71000	71974	212.15	−61.00	−0.50	4.264	1.021	7.002	1.023	292.0	1.397	4.571
72000	72999	208.65	−64.50	−0.00	3.625	1.020	6.053	1.020	289.6	1.377	4.500
73000	74025	205.15	−68.00	0.50	3.073	1.021	5.219	1.018	287.1	1.358	4.429
74000	75051	201.65	−71.50	1.00	2.598	1.021	4.489	1.016	284.7	1.338	4.358
75000	76077	198.15	−75.00	1.50	2.190	1.022	3.850	1.015	282.2	1.318	4.286
76000	77104	194.65	−78.50	2.00	1.840 − 2	1.024	3.294 − 5	1.013	279.7	1.298 − 5	4.214 − 6
77000	78131	191.15	−82.00	2.50	1.542	1.026	2.810	1.013	277.2	1.278	4.142
78000	79159	187.65	−85.50	3.00	1.287	1.029	2.390	1.013	274.6	1.257	4.070
79000	80186	184.15	−89.00	3.50	1.071	1.032	2.026	1.013	272.0	1.237	3.998
80000	81214	180.65	−92.50	−0.02	8.881 − 3	1.034	1.713	1.034	269.4	1.216	3.925
81000	82243	177.15	−96.00	−3.53	7.337	1.032	1.443	1.052	266.8	1.196	3.852
82000	83271	177.15	−96.00	−3.54	6.050	1.028	1.190	1.048	266.8	1.196	3.852
83000	84300	177.15	−96.00	−3.55	4.989	1.024	9.811 − 6	1.045	266.8	1.196	3.852
84000	85330	177.15	−96.00	−3.57	4.114	1.021	8.091	1.041	266.8	1.196	3.852
85000	86359	177.15	−96.00	−3.58	3.393	1.017	6.672	1.037	266.8	1.196	3.852
86000	87389	177.15	−96.00	−3.59	2.798 − 3	1.013	5.501 − 6	1.033	266.8	1.196 − 5	3.852 − 6
87000	88420	177.15	−96.00	−3.60	2.307	1.009	4.536	1.029	266.8	1.196	3.852
88000	89450	177.15	−96.00	−3.62	1.902	1.005	3.741	1.025	266.8	1.196	3.852
89000	90481	176.82	−96.33	−4.52	1.569	1.002	3.085	1.026	266.8	1.196	3.852
90000	91513	176.07	−97.08	−5.84	1.295	0.997	2.518	1.026	266.3	1.207	3.894
92000	93576	182.19	−90.96	−8.45	8.880 − 4	0.984	1.689	1.024	271.3	1.231	3.977
94000	95641	189.36	−83.79	−11.39	6.140	0.968	1.143	1.019	274.2	1.255	4.060
96000	97708	187.47	−85.68	−14.89	4.278	0.949	7.797 − 7	1.008	277.2	1.278	4.142
98000	99775	190.82	−82.33	−18.24	3.003	0.928	5.361	0.995	280.0	1.301	4.225
100000	101844	192.98	−80.17	−24.72	2.124	0.904	3.715	0.992	282.9	1.324	4.307
102000	103914	195.93	−77.22	−22.13	1.525 − 4	0.880	2.489 − 7	0.945	292.9	1.404 − 5	4.597 − 6
104000	105986	217.44	−55.71	−19.52	1.118	0.865	1.711	0.909	302.5	1.482	4.884
106000	108059	239.14	−34.02	−16.80	8.361 − 5	0.855	1.203	0.882	311.9	1.558	5.167
108000	110133	242.11	−31.06	−14.11	6.356	0.850	8.637 − 8	0.862	321.0	1.632	5.446
110000	112209	254.47	−18.68	−20.77	4.904	0.845	6.312	0.874	329.8	1.704	5.721
112000	114286	284.17	10.98	−6.38	3.871	0.844	4.377	0.824	351.9	1.884	6.424
114000	116364	321.67	48.52	7.91	3.140	0.853	3.166	0.794	372.6	2.054	7.101
116000	118444	354.95	81.80	22.23	2.602	0.868	2.368	0.776	392.3	2.215	7.754

TABLE 5.1.—*Continued*
15° N. Annual
GEOMETRIC ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, m	H, m'	T, °K	t, °C	$T-T_{std}$	P, mb	$\frac{P}{P_{std}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{std}}$	C_s, m sec^{-1}	μ, kg m^{-1} sec^{-1}	λ, kcal m^{-1} sec^{-1} (°K)$^{-1}$
29000	28801	230.11	−43.04	4.59	1.413 + 1	1.016	2.138 − 2	0.996	304.1	1.495 − 5	4.931 − 6
29500	29295	231.20	−41.95	5.18	1.313	1.018	1.978	0.995	304.8	1.500	4.953
30000	29789	232.29	−40.86	5.78	1.221	1.020	1.831	0.994	305.5	1.506	4.974
30500	30283	233.37	−39.78	6.37	1.135	1.022	1.695	0.994	306.2	1.512	4.996
31000	30777	234.46	−38.69	6.96	1.056	1.024	1.569	0.994	307.0	1.518	5.017
31500	31271	235.55	−37.60	7.55	9.830 + 0	1.027	1.454	0.994	307.7	1.524	5.039
32000	31765	236.63	−36.52	8.14	9.152	1.029	1.347	0.994	308.4	1.529	5.060
33000	32753	238.80	−34.35	7.83	7.941	1.035	1.158	1.001	309.8	1.541	5.103
34000	33740	240.98	−32.17	7.23	6.900	1.040	9.974 − 3	1.009	311.2	1.552	5.146
35000	34727	243.15	−30.00	6.63	6.003	1.045	8.600	1.016	312.6	1.564	5.189
36000	35713	245.32	−27.83	6.04	5.229 + 0	1.049	7.425 − 3	1.023	314.0	1.575 − 5	5.231 − 6
37000	36700	247.49	−25.66	5.44	4.561	1.053	6.419	1.029	315.4	1.586	5.274
38000	37686	249.66	−23.49	4.84	3.983	1.056	5.557	1.035	316.8	1.597	5.316
39000	38671	251.83	−21.32	4.24	3.482	1.059	4.817	1.041	318.1	1.609	5.358
40000	39657	253.99	−19.16	3.64	3.048	1.062	4.181	1.046	319.5	1.620	5.400
41000	40642	256.16	−16.99	3.05	2.671	1.064	3.633	1.051	320.8	1.631	42
42000	41626	258.33	−14.82	2.45	2.344	1.065	3.161	1.055	322.2	1.642	
43000	42611	260.49	−12.66	1.85	2.059	1.067	2.753	1.059	323.6	1.653	
44000	43595	262.66	−10.49	1.25	1.811	1.068	2.401	1.063	324.9	1.664	
45000	44579	264.82	−8.33	0.66	1.594	1.069	2.097	1.067	326.2	1.675	
46000	45562	266.99	−6.16	0.06	1.405 + 0	1.070	1.833 − 3	1.069	327.6	1.685 − 5	5. 21 − 6
47000	46545	269.15	−4.00	−0.54	1.239	1.070	1.604	1.072	328.9	1.696	5.693
48000	47528	270.15	−3.00	−0.50	1.094	1.070	1.411	1.072	329.5	1.701	5.712
49000	48511	270.15	−3.00	−0.50	9.665 − 1	1.070	1.246	1.072	329.5	1.701	5.712
50000	49493	270.15	−3.00	−0.50	8.536	1.070	1.101	1.072	329.5	1.701	5.712
51000	50475	270.15	−3.00	−0.50	7.539	1.070	9.722 − 4	1.072	329.5	1.701	5.712
52000	51457	269.24	−3.91	−1.41	6.658	1.070	8.615	1.076	328.9	1.697	5.694
53000	52438	267.27	−5.88	−2.25	5.876	1.069	7.659	1.078	327.7	1.687	5.657
54000	53419	265.31	−7.84	−2.25	5.181	1.068	6.803	1.077	326.5	1.677	5.619
55000	54400	263.35	−9.80	−2.24	4.564	1.068	6.038	1.077	325.3	1.667	5.581
56000	55380	261.39	−11.76	−2.24	4.017 − 1	1.067	5.354 − 4	1.076	324.1	1.657 − 5	5.544 − 6
57000	56360	259.43	−13.72	−2.23	3.532	1.066	4.743	1.075	322.9	1.647	5.506
58000	57340	257.47	−15.68	−2.23	3.103	1.065	4.199	1.074	321.7	1.637	5.468
59000	58320	255.51	−17.64	−2.23	2.724	1.064	3.714	1.074	320.4	1.627	5.430
60000	59299	253.10	−20.05	−2.67	2.388	1.063	3.287	1.075	318.9	1.615	5.383
61000	60278	249.68	−23.47	−4.13	2.091	1.062	2.917	1.079	316.8	1.597	5.316
62000	61256	246.25	−26.90	−4.79	1.827	1.060	2.585	1.080	314.6	1.580	5.249
63000	62235	242.83	−30.32	−4.30	1.594	1.057	2.266	1.076	312.4	1.562	5.182
64000	63213	239.40	−33.75	−3.80	1.387	1.055	2.019	1.072	310.2	1.544	5.115
65000	64190	235.98	−37.17	−3.30	1.206	1.053	1.780	1.068	308.0	1.526	5.047
66000	65168	232.56	−40.59	−2.80	1.045 − 1	1.052	1.566 − 4	1.065	305.7	1.508 − 5	4.980 − 6
67000	66145	229.14	−44.01	−2.30	9.047 − 2	1.050	1.375	1.061	303.5	1.489	4.912
68000	67121	225.72	−47.43	−1.80	7.812	1.049	1.206	1.058	301.2	1.471	4.844
69000	68098	222.31	−50.84	−1.31	6.731	1.049	1.055	1.055	298.9	1.453	4.775
70000	69074	218.89	−54.26	−0.81	5.787	1.048	9.210 − 5	1.052	296.6	1.434	4.707
71000	70050	215.47	−57.68	−0.31	4.963	1.048	8.024	1.050	294.3	1.415	4.638
72000	71025	212.06	−61.09	0.18	4.247	1.049	6.977	1.048	291.9	1.396	4.569
73000	72001	208.65	−64.50	0.68	3.625	1.049	6.052	1.046	289.6	1.377	4.500
74000	72976	205.23	−67.92	1.18	3.086	1.050	5.238	1.044	287.2	1.358	4.431
75000	73950	201.82	−71.33	1.67	2.620	1.052	4.523	1.043	284.8	1.339	4.361
76000	74925	198.41	−74.74	2.17	2.219 − 2	1.054	3.895 − 5	1.043	282.4	1.320 − 5	4.292 − 6
77000	75899	195.00	−78.15	2.66	1.873	1.057	3.347	1.043	279.9	1.300	4.222
78000	76872	191.60	−81.55	3.17	1.577	1.060	2.868	1.043	277.5	1.280	4.152
79000	77846	188.19	−84.96	3.66	1.324	1.064	2.451	1.043	275.0	1.261	4.081
80000	78819	184.78	−88.37	4.13	1.108	1.068	2.088	1.045	272.5	1.241	4.011
81000	79792	181.37	−91.78	0.72	9.238 − 3	1.072	1.774	1.068	270.0	1.221	3.940
82000	80764	177.95	−95.20	−2.70	7.678	1.071	1.503	1.087	267.4	1.200	3.870
83000	81736	177.11	−96.04	−3.54	6.366	1.068	1.252	1.089	266.8	1.196	3.852
84000	82708	177.11	−96.05	−3.55	5.278	1.064	1.038	1.085	266.8	1.196	3.852
85000	83680	177.11	−96.05	−3.56	4.376	1.061	8.606 − 6	1.082	266.8	1.196	3.852
86000	84651	177.11	−96.07	−3.57	3.629 − 3	1.058	7.136 − 6	1.078	266.8	1.196 − 5	3.852 − 6
87000	85622	177.11	−96.09	−3.59	3.009	1.054	5.917	1.075	266.8	1.196	3.852
88000	86593	177.11	−96.10	−3.60	2.495	1.051	4.907	1.072	266.8	1.196	3.852
89000	87563	177.11	−96.11	−3.61	2.069	1.047	4.070	1.068	266.8	1.196	3.852
90000	88533	177.11	−96.12	−3.62	1.716	1.044	3.375	1.065	266.8	1.196	3.852
92000	90472	177.11	−96.13	−3.62	1.184	1.034	2.290	1.071	269.0	1.213	3.914
94000	92410	180.44	−92.71	−9.66	8.227 − 4	1.020	1.558	1.068	271.9	1.236	3.994
96000	94347	183.77	−89.38	−12.68	5.763	1.003	1.069	1.060	274.8	1.259	4.074
98000	96283	186.23	−86.92	−16.05	4.067	0.983	7.391 − 7	1.049	277.6	1.281	4.154
100000	98217	190.73	−82.45	−19.32	2.891	0.961	5.150	1.035	280.4	1.303	4.234
102000	100151	194.92	−78.23	−25.74	2.070 − 4	0.936	3.601 − 7	1.031	283.7	1.330 − 5	4.329 − 6
104000	102083	205.94	−67.17	−23.20	1.505	0.912	2.449	0.983	293.3	1.407	4.609
106000	104014	217.92	−55.21	−20.66	1.116	0.896	1.707	0.946	302.6	1.482	4.886
108000	105943	229.73	−43.37	−18.07	8.429 − 5	0.885	1.215	0.918	311.6	1.556	5.159
110000	107872	241.53	−31.63	−15.45	6.466	0.879	8.818 − 8	0.897	320.4	1.627	5.428
112000	109799	253.25	−19.93	−22.60	5.030	0.873	6.509	0.910	328.9	1.697	5.694
114000	111725	263.57	−9.62	−10.95	3.992	0.869	4.591	0.863	348.9	1.860	6.329
116000	113650	315.82	42.67	2.81	3.252	0.876	3.342	0.828	369.1	2.025	6.984
118000	115573	347.87	74.72	16.54	2.704	0.889	2.513	0.807	388.2	2.181	7.616

TABLE 5.1.—*Continued*

30° N. January

GEOPOTENTIAL ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, m'	Z, m	T, °K	t, °C	$T-T_{std}$	P, mb	$\frac{P}{P_{std}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{std}}$	C_s, m sec^{-1}	μ, kg m^{-1} sec^{-1}	λ, k-cal m^{-1} sec^{-1} (°K)$^{-1}$
0	0	288.52	15.37	0.37	1.02100 + 3	1.008	1.233 + 0	1.000	340.5	1.791 − 5	6.060 − 6
250	250	287.70	14.55	1.18	9.912 + 2	1.008	1.200	1.004	340.0	1.787	6.045
500	501	286.88	13.73	1.98	9.621	1.008	1.168	1.001	339.5	1.783	6.029
750	751	286.06	12.91	2.79	9.339	1.008	1.137	0.998	339.1	1.779	6.014
1000	1002	285.24	12.09	3.59	9.064	1.009	1.107	0.995	338.6	1.775	5.998
1250	1252	284.40	11.25	4.37	8.796	1.009	1.077	0.993	338.1	1.771	5.982
1500	1502	283.55	10.40	5.15	8.535	1.009	1.049	0.991	337.6	1.767	5.966
1750	1753	282.71	9.56	5.93	8.282	1.010	1.021	0.999	337.1	1.763	5.951
2000	2003	281.86	8.71	6.71	8.035	1.011	9.931 − 1	0.987	336.6	1.759	5.935
2250	2254	280.17	7.02	6.65	7.794	1.011	9.692	0.988	335.5	1.751	5.903
2500	2504	278.48	5.33	6.58	7.560 + 2	1.012	9.457 − 1	0.988	334.5	1.742 − 5	5.870 − 6
2750	2755	276.79	3.64	6.51	7.331	1.013	9.226	0.989	333.5	1.734	5.838
3000	3006	275.10	1.95	6.45	7.107	1.014	9.000	0.990	332.5	1.726	5.806
3250	3256	273.42	0.27	6.40	6.889	1.014	8.778	0.991	331.5	1.717	5.774
3500	3507	271.74	−1.41	6.34	6.677	1.015	8.559	0.992	330.5	1.709	5.742
3750	3757	270.07	−3.08	6.29	6.470	1.016	8.345	0.992	329.4	1.701	5.710
4000	4008	268.39	−4.76	6.24	6.268	1.017	8.135	0.993	328.4	1.692	5.678
4250	4259	266.75	−6.40	6.22	6.071	1.018	7.928	0.994	327.4	1.684	5.647
4500	4509	265.19	−8.05	6.20	5.879	1.018	7.725	0.995	326.4	1.676	5.615
4750	4760	263.46	−9.69	6.18	5.692	1.019	7.526	0.995	325.4	1.668	5.583
5000	5011	261.81	−11.34	6.16	5.510 + 2	1.020	7.331 − 1	0.996	324.4	1.659 − 5	5.552 − 6
5250	5262	260.17	−12.98	6.15	5.332	1.021	7.140	0.997	323.4	1.651	5.520
5500	5512	258.53	−14.62	6.13	5.160	1.021	6.953	0.997	322.3	1.643	5.488
5750	5763	256.88	−16.27	6.11	4.991	1.022	6.769	0.998	321.3	1.634	5.456
6000	6014	255.24	−17.91	6.09	4.828	1.023	6.589	0.999	320.3	1.626	5.425
6250	6265	253.61	−19.54	6.08	4.668	1.024	6.413	0.999	319.2	1.618	5.393
6500	6516	251.98	−21.17	6.08	4.513	1.025	6.240	1.000	318.2	1.609	5.361
6750	6766	250.34	−22.81	6.07	4.362	1.026	6.070	1.001	317.2	1.601	5.329
7000	7017	248.71	−24.44	6.06	4.216	1.027	5.905	1.002	316.2	1.592	5.298
7250	7268	247.08	−26.07	6.06	4.073	1.027	5.742	1.002	315.1	1.584	5.266
7500	7519	245.45	−27.70	6.05	3.934 + 2	1.028	5.583 − 1	1.003	314.1	1.576 − 5	5.234 − 6
7750	7770	243.82	−29.33	6.04	3.799	1.029	5.428	1.004	313.0	1.567	5.202
8000	8021	242.18	−30.97	6.03	3.668	1.030	5.276	1.005	312.0	1.559	5.170
8250	8272	240.56	−32.59	6.03	3.540	1.031	5.127	1.005	310.9	1.550	5.138
8500	8523	238.93	−34.22	6.03	3.416	1.032	4.981	1.006	309.9	1.541	5.106
8750	8774	237.30	−35.85	6.03	3.296	1.033	4.839	1.007	308.8	1.533	5.073
9000	9025	235.67	−37.48	6.02	3.179	1.034	4.699	1.008	307.8	1.524	5.041
9250	9276	234.05	−39.10	6.02	3.066	1.035	4.563	1.008	306.7	1.516	5.009
9500	9527	232.42	−40.73	6.02	2.955	1.036	4.430	1.009	305.6	1.5[illegible]	4.977
9750	9778	230.79	−42.36	6.01	2.848	1.037	4.299	1.010	304.5	1.498	4.945
10000	10030	229.16	−43.99	6.01	2.744 + 2	1.038	4.172 − 1	1.011	303.5	1.490 − 5	4.912 − 6
10250	10281	227.53	−45.62	6.01	2.644	1.039	4.048	1.012	302.4	1.481	4.880
10500	10532	225.91	−47.24	6.01	2.546	1.040	3.926	1.013	301.3	1.472	4.847
10750	10783	224.28	−48.87	6.00	2.451	1.041	3.807	1.013	300.2	1.463	4.815
11000	11034	222.69	−50.50	6.00	2.359	1.043	3.691	1.014	299.1	1.454	4.782
11500	11537	219.40	−53.75	2.75	2.184	1.044	3.467	1.031	296.9	1.437	4.717
12000	12039	216.15	−57.00	−0.50	2.019	1.045	3.254	1.047	294.7	1.419	4.652
12500	12542	214.85	−58.30	−1.80	1.865	1.044	3.024	1.053	293.8	1.412	4.625
13000	13045	213.55	−59.60	−3.10	1.722	1.043	2.809	1.058	293.0	1.405	4.599
13500	13547	212.25	−60.90	−4.40	1.589	1.042	2.609	1.063	292.1	1.397	4.573
14000	14050	210.95	−62.20	−5.70	1.466 + 2	1.040	2.421 − 1	1.068	291.2	1.390 − 5	4.547 − 6
14500	14553	209.65	−63.50	−7.00	1.352	1.037	2.246	1.072	290.3	1.383	4.520
15000	15056	208.35	−64.80	−8.30	1.246	1.035	2.083	1.075	289.4	1.376	4.494
15500	15559	207.05	−66.10	−9.60	1.147	1.031	1.930	1.078	288.5	1.368	4.468
16000	16062	205.75	−67.40	−10.90	1.056	1.026	1.788	1.081	287.6	1.361	4.441
16500	16566	204.45	−68.70	−12.20	9.718 + 1	1.022	1.656	1.083	286.6	1.354	4.415
17000	17069	203.15	−70.00	−13.50	8.937	1.017	1.533	1.085	285.7	1.346	4.388
17500	17572	203.15	−70.00	−13.50	8.216	1.012	1.409	1.079	285.7	1.346	4.388
18000	18076	203.15	−70.00	−13.50	7.553	1.006	1.295	1.073	285.7	1.346	4.388
18500	18580	204.40	−68.75	−12.25	6.946	1.001	1.184	1.062	286.6	1.353	4.414
19000	19083	205.65	−67.50	−11.00	6.391 + 1	0.997	1.083 − 1	1.050	287.5	1.360 − 5	4.439 − 6
19500	19587	206.90	−66.25	−9.75	5.883	0.992	9.905 − 2	1.040	288.4	1.368	4.465
20000	20091	208.15	−65.00	−8.50	5.418	0.990	9.068	1.030	289.2	1.376	4.490
20500	20595	209.40	−63.75	−7.75	4.992	0.987	8.306	1.023	290.1	1.381	4.515
21000	21099	210.65	−62.50	−7.00	4.602	0.984	7.611	1.017	291.0	1.388	4.541
21500	21603	211.90	−61.25	−6.25	4.245	0.982	6.979	1.010	291.8	1.395	4.566
22000	22107	213.15	−60.00	−5.50	3.917	0.979	6.402	1.005	292.7	1.402	4.591
22500	22611	214.15	−59.00	−5.00	3.616	0.977	5.883	1.000	293.4	1.408	4.611
23000	23115	215.15	−58.00	−4.50	3.340	0.976	5.407	0.996	294.0	1.413	4.631
23500	23620	216.15	−57.00	−4.00	3.085	0.974	4.972	0.992	294.7	1.419	4.652
24000	24124	217.15	−56.00	−3.50	2.851 + 1	0.973	4.574 − 2	0.989	295.4	1.424 − 5	4.672 − 6
24500	24629	218.15	−55.00	−3.00	2.636	0.972	4.210	0.985	296.1	1.430	4.692
25000	25133	219.15	−54.00	−2.50	2.438	0.971	3.876	0.982	296.8	1.435	4.712
25500	25638	220.15	−53.00	−2.00	2.256	0.970	3.569	0.979	297.4	1.441	4.732
26000	26143	221.15	−52.00	−1.50	2.088	0.970	3.288	0.976	298.1	1.446	4.752
26500	26648	222.15	−51.00	−1.00	1.933	0.969	3.031	0.974	298.8	1.452	4.772
27000	27153	223.15	−50.00	−0.50	1.790	0.969	2.794	0.971	299.5	1.457	4.792
27500	27658	224.15	−49.00	−0.00	1.658	0.969	2.577	0.969	300.1	1.463	4.812
28000	28163	225.15	−48.00	0.50	1.537	0.969	2.378	0.967	300.8	1.468	4.832
28500	28668	226.15	−47.00	1.00	1.425	0.969	2.195	0.965	301.5	1.473	4.852

TABLE 5.1.—*Continued*
30° N. January
GEOMETRIC ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, m	H, m	T, °K	t, °C	$T-T_{std}$	P, mb	$\frac{P}{P_{std}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{std}}$	C_s m sec^{-1}	μ kg m^{-1} sec^{-1}	k k-cal m^{-1} sec^{-1}(°K)$^{-1}$
0	0	288.52	15.37	0.37	1.02100 + 3	1.008	1.233 + 0	1.006	340.5	1.791 − 5	6.060 − 6
250	250	287.70	14.55	1.18	9.912 + 2	1.008	1.200	1.004	340.0	1.787	6.045
500	499	286.88	13.73	1.98	9.622	1.008	1.168	1.001	339.5	1.783	6.029
750	749	286.07	12.92	2.79	9.340	1.008	1.137	0.999	339.1	1.779	6.014
1000	998	285.25	12.10	3.60	9.065	1.009	1.107	0.996	338.6	1.775	5.998
1250	1248	284.41	11.26	4.38	8.798	1.009	1.078	0.993	338.1	1.771	5.983
1500	1498	283.56	10.41	5.16	8.538	1.010	1.049	0.991	337.6	1.767	5.967
1750	1747	282.72	9.57	5.94	8.285	1.010	1.021	0.989	337.1	1.763	5.951
2000	1997	281.87	8.72	6.72	8.038	1.011	9.934 − 1	0.987	336.6	1.759	5.935
2250	2246	280.20	7.05	6.67	7.798	1.012	9.695	0.988	335.6	1.751	5.903
2500	2496	278.51	5.36	6.60	7.564 + 2	1.013	9.461 − 1	0.989	334.6	1.742 − 5	5.871 − 6
2750	2745	276.82	3.67	6.54	7.335	1.013	9.231	0.989	333.5	1.734	5.839
3000	2994	275.14	1.99	6.48	7.112	1.014	9.005	0.990	332.5	1.726	5.807
3250	3244	273.46	0.31	6.43	6.895	1.015	8.783	0.991	331.5	1.718	5.775
3500	3493	271.79	−1.36	6.38	6.682	1.016	8.565	0.992	330.5	1.709	5.743
3750	3743	270.12	−3.03	6.33	6.476	1.017	8.352	0.993	329.5	1.701	5.711
4000	3992	268.44	−4.71	6.28	6.274	1.018	8.142	0.994	328.5	1.693	5.679
4250	4241	266.80	−6.35	6.26	6.077	1.018	7.935	0.994	327.4	1.684	5.648
4500	4491	265.16	−7.99	6.24	5.886	1.019	7.733	0.995	326.4	1.676	5.616
4750	4740	263.52	−9.63	6.23	5.699	1.020	7.534	0.996	325.4	1.668	5.585
5000	4989	261.88	−11.27	6.21	5.517 + 2	1.021	7.340 − 1	0.997	324.4	1.660 − 5	5.553 − 6
5250	5238	260.25	−12.90	6.19	5.340	1.022	7.149	0.997	323.4	1.651	5.522
5500	5488	258.61	−14.54	6.18	5.168	1.023	6.962	0.998	322.4	1.643	5.490
5750	5737	256.97	−16.18	6.16	5.000	1.023	6.779	0.999	321.4	1.635	5.458
6000	5986	255.33	−17.82	6.14	4.837	1.024	6.599	1.000	320.3	1.626	5.426
6250	6235	253.70	−19.45	6.14	4.678	1.025	6.423	1.000	319.3	1.618	5.395
6500	6484	252.08	−21.07	6.13	4.523	1.026	6.250	1.001	318.3	1.610	5.363
6750	6734	250.45	−22.70	6.13	4.372	1.027	6.081	1.002	317.3	1.601	5.331
7000	6983	248.82	−24.33	6.12	4.226	1.028	5.916	1.003	316.2	1.593	5.300
7250	7232	247.20	−25.95	6.12	4.083	1.029	5.754	1.003	315.2	1.585	5.268
7500	7481	245.57	−27.58	6.12	3.944 + 2	1.030	5.595 − 1	1.004	314.1	1.576 − 5	5.236 − 6
7750	7730	243.95	−29.20	6.11	3.810	1.031	5.440	1.005	313.1	1.568	5.204
8000	7979	242.32	−30.83	6.11	3.679	1.032	5.288	1.006	312.1	1.559	5.172
8250	8228	240.70	−32.45	6.11	3.552	1.033	5.140	1.007	311.0	1.551	5.140
8500	8477	239.08	−34.07	6.10	3.428	1.034	4.995	1.007	310.0	1.542	5.109
8750	8726	237.46	−35.69	6.10	3.307	1.035	4.852	1.008	308.9	1.534	5.077
9000	8975	235.84	−37.31	6.10	3.191	1.036	4.713	1.009	307.9	1.525	5.045
9250	9224	234.22	−38.93	6.10	3.077	1.037	4.577	1.010	306.8	1.517	5.012
9500	9473	232.59	−40.56	6.10	2.967	1.038	4.444	1.011	305.7	1.508	4.980
9750	9722	230.97	−42.18	6.10	2.860	1.039	4.314	1.012	304.6	1.499	4.948
10000	9971	229.35	−43.80	6.10	2.757 + 2	1.040	4.187 − 1	1.013	303.6	1.491 − 5	4.916 − 6
10250	10219	227.73	−45.42	6.10	2.656	1.042	4.063	1.013	302.5	1.482	4.884
10500	10468	226.11	−47.04	6.10	2.558	1.042	3.941	1.014	301.4	1.473	4.851
10750	10717	224.49	−48.66	6.10	2.463	1.044	3.823	1.015	300.4	1.464	4.819
11000	10966	222.87	−50.28	6.10	2.372	1.045	3.707	1.016	299.3	1.456	4.787
11500	11464	219.64	−53.51	2.99	2.196	1.047	3.483	1.032	297.1	1.438	4.722
12000	11961	216.40	−56.75	−0.25	2.032	1.047	3.270	1.049	294.9	1.420	4.6
12500	12458	214.96	−58.19	−1.69	1.878	1.047	3.063	1.055	293.9	1.412	4.6
13000	12956	213.66	−59.49	−2.99	1.734	1.046	.28	1.061	293.0	1.405	4.602
13500	13453	212.37	−60.78	−4.28	1.602	1.045	2.027	1.066	292	1.398	4.575
14000	13950	211.08	−62.07	−5.57	1.478 + 2	1.043	2.439 − 1	1.070	29	1.391 − 5	4.549 − 6
14500	14447	209.79	−63.36	−6.86	1.363	1.041	2.264	1.075	290.4	1.384	4.523
15000	14944	208.49	−64.66	−8.16	1.257	1.038	2.101	1.078	289.5	1.376	4.497
15500	15441	207.20	−65.95	−9.45	1.159	1.034	1.948	1.082	288	1.369	4.472
16000	15938	205.91	−67.24	−10.74	1.067	1.031	1.805	1.084	287.	1.362	4.444
16500	16435	204.62	−68.53	−12.03	9.825 + 1	1.026	1.673	1.087	286.8	1.355	4.418
17000	16931	203.33	−69.82	−13.32	9.040	1.022	1.549	1.088	285.9	1.347	4.392
17500	17428	203.15	−70.00	−13.50	8.316	1.016	1.426	1.084	285.7	1.346	4.388
18000	17925	203.15	−70.00	−13.50	7.650	1.011	1.312	1.079	285.7	1.346	4.388
18500	18421	204.20	−68.95	−12.45	7.038	1.006	1.201	1.067	286.5	1.352	4.410
19000	18917	205.44	−67.71	−11.21	6.479 + 1	1.002	1.099 − 1	1.056	287.3	1.359 − 5	4.435 − 6
19500	19414	206.68	−66.47	−9.97	5.967	0.998	1.006	1.046	288.2	1.366	4.460
20000	19910	207.92	−65.23	−8.73	5.499	0.995	9.213 − 2	1.039	289.1	1.373	4.485
20500	20406	209.16	−63.99	−7.92	5.070	0.992	8.444	1.029	289.9	1.380	4.511
21000	20902	210.40	−62.75	−7.18	4.676	0.989	7.742	1.022	290.8	1.387	4.536
21500	21398	211.64	−61.51	−6.43	4.315	0.987	7.103	1.016	291.6	1.394	4.561
22000	21894	212.88	−60.27	−5.69	3.984	0.985	6.520	1.011	292.5	1.401	4.586
22500	22390	213.93	−59.22	−5.14	3.680	0.982	5.993	1.006	293.2	1.407	4.607
23000	22886	214.92	−58.23	−4.65	3.401	0.981	5.512	1.002	293.9	1.412	4.627
23500	23381	215.91	−57.24	−4.15	3.144	0.980	5.072	0.998	294.6	1.418	4.647
24000	23877	216.90	−56.25	−3.66	2.907 + 1	0.978	4.669 − 2	0.995	295.2	1.423 − 5	4.667 − 6
24500	24372	217.89	−55.26	−3.16	2.689	0.977	4.300	0.991	295.9	1.428	4.687
25000	24868	218.89	−54.26	−2.67	2.489	0.976	3.961	0.988	296.6	1.434	4.707
25500	25363	219.88	−53.27	−2.17	2.304	0.975	3.650	0.985	297.3	1.439	4.727
26000	25858	220.87	−52.28	−1.68	2.134	0.975	3.365	0.982	297.9	1.445	4.746
26500	26354	221.86	−51.29	−1.18	1.977	0.975	3.104	0.980	298.6	1.450	4.766
27000	26849	222.85	−50.30	−0.69	1.832	0.974	2.864	0.977	299.3	1.455	4.785
27500	27344	223.84	−49.31	−0.19	1.698	0.974	2.643	0.975	299.9	1.461	4.806
28000	27839	224.83	−48.32	0.30	1.575	0.975	2.440	0.973	300.6	1.466	4.826
28500	28334	225.82	−47.33	0.79	1.461	0.975	2.256	0.971	301.2	1.472	4.845

TABLE 5.1.—*Continued*
30° N. January
GEOPOTENTIAL ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, m'	Z, m	T, °K	t, °C	$T-T_{std}$	P, mb	$\frac{P}{P_{std}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{std}}$	C_s m sec^{-1}	μ kg m^{-1} sec^{-1}	k kcal m^{-1} sec^{-1}(°K)$^{-1}$
29000	29173	227.15	-46.00	1.50	1.321 + 1	0.970	2.027 - 2	0.963	302.1	1.479 - 5	4.872 - 6
29500	29679	228.15	-45.00	2.00	1.226	0.970	1.872	0.961	302.8	1.484	4.892
30000	30184	229.15	-44.00	2.50	1.138	0.971	1.730	0.960	303.5	1.489	4.912
30500	30689	230.15	-43.00	3.00	1.056	0.972	1.599	0.959	304.1	1.495	4.932
31000	31195	231.15	-42.00	3.50	9.807 + 0	0.973	1.478	0.958	304.8	1.500	4.952
31500	31701	232.15	-41.00	4.00	9.110	0.974	1.367	0.957	305.4	1.506	4.972
32000	32208	233.15	-40.00	4.50	8.465	0.975	1.265	0.957	306.1	1.511	4.991
33000	33218	235.55	-37.60	4.10	7.317	0.978	1.082	0.961	307.7	1.524	5.039
34000	34230	237.95	-35.20	3.70	6.334	0.980	9.273 - 3	0.965	309.2	1.536	5.086
35000	35243	240.35	-32.80	3.30	5.491	0.982	7.958	0.969	310.8	1.549	5.134
36000	36255	242.75	-30.40	2.90	4.766 + 0	0.984	6.840 - 3	0.972	312.3	1.561 - 5	5.181 - 6
37000	37268	245.15	-28.00	2.50	4.144	0.986	5.888	0.976	313.9	1.574	5.228
38000	38282	247.55	-25.60	2.10	3.607	0.987	5.076	0.979	315.4	1.586	5.275
39000	39295	249.95	-23.20	1.70	3.144	0.988	4.382	0.981	316.9	1.599	5.322
40000	40309	252.35	-20.80	1.30	2.744	0.989	3.788	0.984	318.5	1.611	5.368
41000	41324	254.75	-18.40	0.90	2.398	0.989	3.280	0.986	320.0	1.624	5.415
42000	42338	257.15	-16.00	0.50	2.099	0.990	2.843	0.988	321.5	1.636	5.462
43000	43353	259.55	-13.60	0.10	1.839	0.990	2.468	0.990	323.0	1.648	5.508
44000	44368	261.95	-11.20	-0.30	1 613	0.990	2.145	0.991	324.5	1.660	5.554
45000	45384	264.35	-8.80	-0.70	1.417	0.990	1.867	0.992	325.9	1.672	5.601
46000	46400	266.75	-6.40	-1.10	1.246 + 0	0.989	1.627 - 3	0.993	327.4	1.684 - 5	5.647 - 6
47000	47416	269.15	-4.00	-1.50	1.096	0.989	1.419	0.994	328.9	1.696	5.693
48000	48433	269.15	-4.00	-1.50	9.657 - 1	0.988	1.250	0.994	328.9	1.696	5.693
49000	49449	269.15	-4.00	-1.50	8.506	0.987	1.101	0.993	328.9	1.696	5.693
50000	50467	269.15	-4.00	-1.50	7.492	0.987	9.697 - 4	0.992	328.9	1.696	5.693
51000	51484	269.15	-4.00	-1.50	6.599	0.986	8.541	0.991	328.9	1.696	5.693
52000	52502	267.15	-6.00	-3.50	5.810	0.985	7.576	0.998	327.7	1.686	5.654
53000	53520	265.15	-8.00	-3.50	5.110	0.983	6.714	0.996	326.4	1.676	5.616
54000	54539	263.15	-10.00	-3.50	4.490	0.981	5.944	0.994	325.2	1.666	5.577
55000	55556	261.15	-12.00	-3.50	3.941	0.980	5.258	0.993	324.0	1.656	5.539
56000	56577	259.15	-14.00	-3.50	3.456 - 1	0.978	4.646 - 4	0.991	322.7	1.646 - 5	5.500 - 6
57000	57596	257.15	-16.00	-3.50	3.028	0.976	4.102	0.990	321.5	1.636	5.462
58000	58616	255.15	-18.00	-3.50	2.650	0.975	3.618	0.988	320.2	1.626	5.423
59000	59636	253.15	-20.00	-3.50	2.316	0.973	3.188	0.986	319.0	1.615	5.384
60000	60656	250.05	-23.10	-4.60	2.022	0.970	2.818	0.989	317.0	1.599	5.324
61000	61677	246.95	-26.20	-5.70	1.763	0.968	2.486	0.990	315.0	1.583	5.263
62000	62698	243.85	-29.30	-4.80	1.534	0.965	2.191	0.984	313.0	1.567	5.202
63000	63720	240.75	-32.40	-3.90	1.332	0.963	1.927	0.978	311.0	1.551	5.141
64000	64741	237.65	-35.50	-3.00	1.155	0.961	1.693	0.973	309.0	1.535	5.080
65000	65764	234.55	-38.60	-2.10	9.990 - 2	0.960	1.484	0.968	307.0	1.518	5.019
66000	66786	231.45	-41.70	-1.20	8.628 - 2	0.958	1.299 - 4	0.963	305.0	1.502 - 5	4.958 - 6
67000	67809	228.35	-44.80	-0.30	7.437	0.958	1.135	0.959	302.9	1.485	4.896
68000	68832	225.25	-47.90	0.60	6.397	0.958	9.893 - 5	0.955	300.9	1.468	4.834
69000	69855	222.15	-51.00	1.50	5.491	0.959	8.610	0.952	298.8	1.452	4.772
70000	70879	219.05	-54.10	2.40	4.703	0.960	7.479	0.949	296.7	1.435	4.710
71000	71903	215.95	-57.20	3.30	4.019	0.962	6.484	0.947	294.6	1.418	4.648
72000	72927	212.85	-60.30	4.20	3.427	0.965	5.609	0.946	292.5	1.401	4.585
73000	73952	209.75	-63.40	5.10	2.916	0.968	4.842	0.945	290.3	1.383	4.522
74000	74977	206.65	-66.50	6.00	2.474	0.973	4.171	0.944	288.2	1.366	4.459
75000	76002	203.55	-69.60	6.90	2.095	0.978	3.585	0.945	286.0	1.349	4.396
76000	77028	200.45	-72.70	7.80	1.769 - 2	0.984	3.074 - 5	0.946	283.8	1.331 - 5	4.333 - 6
77000	[illegible]	197.35	-75.80	8.70	1.490	0.992	2.630	0.948	281.6	1.313	4.270
78000	79080	194.25	-78.90	9.60	1.251	1.000	2.244	0.951	279.4	1.296	4.206
79000	80107	191.15	-82.00	10.50	1.048	1.009	1.910	0.954	277.2	1.278	4.142
80000	81134	191.15	-82.00	10.48	8.764 - 3	1.020	1.597	0.964	277.2	1.278	4.142
81000	82161	191.15	-82.00	10.47	7.329	1.031	1.336	0.974	277.2	1.278	4.142
82000	83189	191.11	-82.04	10.46	6.130	1.042	1.117	0.984	277.2	1.278	4.142
83000	84217	191.09	-82.06	10.44	5.127	1.053	9.343 - 6	0.995	277.2	1.278	4.142
84000	85245	191.08	-82.07	10.43	4.287	1.064	7.814	1.005	277.2	1.278	4.142
85000	86274	191.07	-82.08	10.42	3.586	1.075	6.535	1.016	277.2	1.278	4.142
86000	87303	191.05	-82.10	10.40	2.999 - 3	1.086	5.465 - 6	1.026	277.2	1.278 - 5	4.142 - 6
87000	88332	191.04	-82.11	10.39	2.508	1.097	4.571	1.037	277.2	1.278	4.142
88000	89361	191.03	-82.12	10.38	2.098	1.109	3.823	1.048	277.2	1.278	4.142
89000	90391	194.44	-78.71	13.80	1.757	1.122	3.145	1.046	279.7	1.298	4.214
90000	91422	197.72	-75.43	13.21	1.477	1.137	2.596	1.051	282.2	1.318	4.286
92000	93483	204.27	-68.88	13.66	1.052	1.166	1.787	1.084	287.1	1.358	4.429
94000	95546	210.80	-62.35	13.79	7.583 - 4	1.195	1.245	1.110	292.0	1.397	4.571
96000	97610	216.94	-57.11	13.28	5.524	1.225	8.781 - 7	1.135	296.8	1.435	4.712
98000	99676	221.97	-51.58	12.86	4.064	1.256	6.240	1.162	301.5	1.473	4.852
100000	101742	227.97	-46.08	9.37	3.018	1.284	4 510	1.204	306.1	1.511	4.991
102000	103811	236.97	-36.18	9.38	2.267 - 4	1.309	3.228 - 7	1.226	313.6	1.572 - 5	5.219 - 6
104000	105880	246.83	-26.32	9.47	1.726	1.335	2.347	1.247	320.9	1.631	5.444
106000	107951	256.64	-16.51	9.71	1.330	1.360	1.730	1.268	328.0	1.689	5.666
108000	110023	266.44	-6.71	10.00	1.036	1.385	1.292	1.289	335.0	1.746	5.886
110000	112096	276.22	3.07	0.98	8.150 - 5	1.404	9.761 - 8	1.392	341.9	1.802	6.104
112000	114171	291.25	18.10	-3.32	6.486	1.414	7.338	1.381	351.8	1.883	6.421
114000	116247	306.25	33.10	-7.51	5.227	1.419	5.602	1.404	361.4	1.962	6.734
116000	118325	321.25	48.08	-11.49	4.258	1.421	4.336	1.422	370.8	2.039	7.041

TABLE 5.1.—*Continued*
30° N. January
GEOMETRIC ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, m	H, m'	T, °K	t, °C	$T-T_{std}$	P, mb	$\frac{P}{P_{std}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{std}}$	C_s, m sec^{-1}	μ, kg m^{-1} sec^{-1}	k, k-cal m^{-1} sec^{-1}(°K)$^{-1}$
29000	28829	226.81	-46.34	1.29	1.356 + 1	0.976	2.083 - 2	0.970	301.9	1.477 - 5	4.865 - 6
29500	29323	227.80	-45.35	1.78	1.259	0.976	1.925	0.968	302.6	1.482	4.885
30000	29818	228.79	-44.36	2.28	1.169	0.977	1.780	0.967	303.2	1.488	4.905
30500	30313	229.77	-43.38	2.77	1.086	0.977	1.646	0.966	303.9	1.493	4.924
31000	30807	230.76	-42.39	3.26	1.009	0.979	1.523	0.965	304.5	1.498	4.944
31500	31302	231.75	-41.40	3.76	9.380 + 0	0.980	1.410	0.964	305.2	1.503	4.964
32000	31796	232.74	-40.41	4.25	8.723	0.981	1.306	0.963	305.8	1.509	4.983
33000	32784	235.03	-38.12	4.06	7.550	0.984	1.119	0.967	307.3	1.521	5.029
34000	33773	237.40	-35.75	3.66	6.544	0.986	9.603 - 3	0.971	308.9	1.533	5.075
35000	34760	239.77	-33.38	3.26	5.681	0.989	8.254	0.975	310.4	1.546	5.122
36000	35748	242.14	-31.01	2.86	4.939 + 0	0.991	7.105 - 3	0.979	311.9	1.558 - 5	5.169 - 6
37000	36735	244.51	-28.64	2.46	4.300	0.993	6.126	0.982	313.5	1.571	5.215
38000	37722	246.88	-26.27	2.06	3.748	0.994	5.289	0.985	315.0	1.583	5.262
39000	38709	249.25	-23.90	1.67	3.272	0.995	4.573	0.988	316.5	1.595	5.308
40000	39695	251.62	-21.53	1.27	2.860	0.996	3.960	0.991	318.0	1.607	5.354
41000	40681	253.98	-19.17	0.87	2.503	0.997	3.434	0.994	319.5	1.620	5.400
42000	41667	256.35	-16.80	0.47	2.194	0.997	2.981	0.995	321.0	1.632	5.446
43000	42652	258.71	-14.44	0.07	1.925	0.997	2.592	0.997	322.4	1.644	5.492
44000	43637	261.08	-12.07	-0.32	1.691	0.998	2.257	0.999	323.9	1.656	5.538
45000	44622	263.44	-9.71	-0.72	1.488	0.998	1.967	1.001	325.4	1.668	5.583
46000	45606	265.81	-7.34	-1.12	1.310 + 0	0.998	1.717 - 3	1.002	326.8	1.679 - 5	5.629 - 6
47000	46591	268.17	-4.98	-1.52	1.155	0.997	1.500	1.003	328.3	1.691	5.674
48000	47575	269.15	-4.00	-1.50	1.019	0.996	1.319	1.002	328.9	1.696	5.693
49000	48558	269.15	-4.00	-1.50	8.996 - 1	0.996	1.165	1.001	328.9	1.696	5.693
50000	49541	269.15	-4.00	-1.50	7.941	0.995	1.028	1.001	328.9	1.696	5.693
51000	50524	269.15	-4.00	-1.50	7.010	0.995	9.073 - 4	1.000	328.9	1.696	5.693
52000	51507	268.14	-5.01	-2.51	6.187	0.994	8.038	1.004	328.3	1.691	5.673
53000	52489	266.17	-6.98	-3.36	5.457	0.993	7.142	1.005	327.1	1.681	5.636
54000	53471	264.21	-8.94	-3.35	4.808	0.992	6.340	1.004	325.8	1.671	5.598
55000	54453	262.24	-10.91	-3.35	4.233	0.990	5.623	1.003	324.6	1.662	5.560
56000	55434	260.28	-12.87	-3.35	3.723 - 1	0.989	4.983 - 4	1.001	323.4	1.652 - 5	5.522 - 6
57000	56415	258.32	-14.83	-3.34	3.272	0.987	4.412	1.000	322.2	1.642	5.484
58000	57396	256.36	-16.79	-3.34	2.872	0.986	3.903	0.999	321.0	1.632	5.446
59000	58377	254.40	-18.75	-3.34	2.519	0.984	3.450	0.997	319.7	1.622	5.408
60000	59357	252.04	-21.11	-3.73	2.207	0.983	3.051	0.997	318.3	1.610	5.362
61000	60337	249.01	-24.14	-4.80	1.931	0.981	2.702	1.000	316.3	1.594	5.303
62000	61316	245.97	-27.18	-5.08	1.687	0.979	2.389	0.998	314.4	1.578	5.244
63000	62295	242.93	-30.22	-4.19	1.471	0.976	2.110	0.993	312.5	1.562	5.184
64000	63274	239.90	-33.25	-3.30	1.281	0.974	1.860	0.987	310.5	1.547	5.125
65000	64253	236.87	-36.28	-2.42	1.113	0.972	1.637	0.983	309.5	1.531	5.065
66000	65231	233.83	-39.32	-1.53	9.659 - 2	0.972	1.439 - 4	0.978	306.5	1.514 - 5	5.005 - 6
67000	66209	230.80	-42.35	-0.65	8.365	0.971	1.263	0.974	304.6	1.498	4.945
68000	67187	227.77	-45.38	0.24	7.231	0.971	1.106	0.970	302.5	1.482	4.884
69000	68164	224.74	-48.41	1.13	6.239	0.972	9.671 - 5	0.967	300.5	1.466	4.824
70000	69142	221.71	-51.44	2.01	5.372	0.973	8.441	0.964	298.5	1.449	4.763
71000	70118	218.68	-54.47	2.89	4.617	0.975	7.355	0.962	296.5	1.433	4.703
72000	71095	215.66	-57.49	3.78	3.959	0.978	6.396	0.960	294.4	1.416	4.642
73000	72071	212.63	-60.52	4.66	3.388	0.981	5.551	0.959	292.3	1.399	4.581
74000	73047	209.60	-63.55	5.55	2.893	0.985	4.809	0.959	290.2	1.383	4.519
75000	74023	206.58	-66.57	6.43	2.465	0.990	4.157	0.959	288.1	1.366	4.458
76000	74998	203.56	-69.59	7.32	2.095 - 2	0.996	3.586 - 5	0.960	286.0	1.349 - 5	4.397 - 6
77000	75973	200.53	-72.62	8.19	1.777	1.003	3.087	0.962	283.9	1.332	4.335
78000	76948	197.51	-75.64	9.08	1.503	1.010	2.651	0.964	281.7	1.314	4.273
79000	77922	194.49	-78.66	9.96	1.268	1.020	2.272	0.967	279.6	1.297	4.211
80000	78896	191.47	-81.68	10.82	1.068	1.029	1.942	0.972	277.4	1.280	4.149
81000	79870	191.14	-82.01	10.49	8.970 - 3	1.041	1.635	0.984	277.2	1.278	4.142
82000	80843	191.12	-82.03	10.47	7.538	1.051	1.374	0.994	277.2	1.278	4.142
83000	81816	191.11	-82.04	10.46	6.334	1.062	1.154	1.004	277.2	1.278	4.142
84000	82789	191.10	-82.05	10.45	5.323	1.073	9.702 - 6	1.015	277.2	1.278	4.142
85000	83762	191.08	-82.07	10.43	4.474	1.085	8.154	1.025	277.2	1.278	4.142
86000	84734	191.07	-82.08	10.42	3.760 - 3	1.096	6.853 - 6	1.036	277.2	1.278 - 5	4.142 - 6
87000	85706	191.06	-82.09	10.41	3.161	1.107	5.760	1.047	277.2	1.278	4.142
88000	86678	191.04	-82.11	10.39	2.657	1.119	4.842	1.057	277.2	1.278	4.142
89000	87649	191.03	-82.12	10.38	2.233	1.130	4.070	1.068	277.2	1.278	4.142
90000	88620	191.10	-82.05	12.54	1.879	1.143	3.386	1.088	278.7	1.290	4.187
92000	90561	199.50	-73.65	12.94	1.341	1.171	2.335	1.092	283.6	1.329	4.326
94000	92501	205.42	-67.73	13.34	9.683 - 4	1.200	1.630	1.117	288.4	1.368	4.465
96000	94440	211.32	-61.83	13.27	7.066	1.229	1.152	1.143	293.0	1.405	4.602
98000	96378	217.04	-56.06	12.81	5.209	1.259	8.231 - 7	1.168	297.7	1.443	4.739
100000	98314	222.43	-50.72	12.41	3.876	1.289	5.942	1.195	302.2	1.479	4.874
102000	100249	226.51	-46.64	8.65	2.910 - 4	1.316	4.322 - 7	1.237	307.0	1.516 - 5	5.020 - 6
104000	102183	230.60	-42.57	8.70	2.210	1.340	3.135	1.257	314.3	1.577	5.240
106000	104116	247.40	-25.79	8.82	1.699	1.364	2.305	1.277	321.3	1.634	5.457
108000	106047	256.88	-16.27	9.03	1.322	1.388	1.718	1.298	328.2	1.691	5.672
110000	107978	266.33	-6.82	9.33	1.039	1.412	1.296	1.318	335.0	1.746	5.884
112000	109907	275.74	2.61	-0.09	8.239 - 5	1.430	9.887 - 8	1.382	341.6	1.800	6.094
114000	111835	290.51	16.46	-4.81	6.606	1.439	7.508	1.411	351.0	1.877	6.395
116000	113762	304.46	31.31	-8.55	5.359	1.443	5.780	1.433	360.3	1.953	6.697
118000	115687	318.49	45.74	-12.44	4.394	1.444	4.509	1.449	369.3	2.027	6.993

TABLE 5.1.—*Continued*

30° N. July

GEOPOTENTIAL ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, m	Z, m	T, °K	t, °C	$T-T_{std}$	P, mb	$\frac{P}{P_{std}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{std}}$	C_s m sec^{-1}	μ kg m^{-1} sec^{-1}	k k cal m^{-1} sec^{-1}(°K)$^{-1}$
0	0	304.58	31.43	16.43	1.01350 + 3	1.000	1.159 + 0	0.946	349.9	1.868 − 5	6.359 − 6
250	250	302.33	29.18	15.81	9.854 + 2	1.002	1.135	0.949	348.6	1.857	6.318
500	501	300.08	26.93	15.18	9.578	1.003	1.112	0.953	347.3	1.846	6.276
750	751	297.83	24.68	14.56	9.308	1.005	1.089	0.956	346.0	1.836	6.234
1000	1002	295.58	22.43	13.93	9.044	1.006	1.066	0.959	344.7	1.825	6.192
1250	1252	294.07	20.92	14.04	8.786	1.008	1.041	0.959	343.8	1.818	6.164
1500	1502	292.56	19.41	14.16	8.534	1.009	1.016	0.960	342.9	1.811	6.136
1750	1753	291.05	17.90	14.27	8.288	1.011	9.920 − 1	0.961	342.0	1.803	6.107
2000	2003	289.54	16.39	14.39	8.048	1.012	9.683	0.962	341.1	1.796	6.079
2250	2254	288.08	14.93	14.56	7.813	1.014	9.448	0.963	340.3	1.789	6.051
2500	2504	286.63	13.48	14.73	7.584 + 2	1.016	9.218 − 1	0.963	339.4	1.782 − 5	6.024 − 6
2750	2755	285.17	12.02	14.90	7.361	1.017	8.992	0.964	338.5	1.775	5.997
3000	3006	283.72	10.57	15.07	7.143	1.019	8.771	0.965	337.7	1.768	5.970
3250	3256	282.24	9.09	15.22	6.931	1.021	8.555	0.966	336.8	1.761	5.942
3500	3507	280.77	7.62	15.37	6.724	1.022	8.343	0.966	335.9	1.754	5.914
3750	3757	279.30	6.15	15.52	6.522	1.024	8.135	0.967	335.0	1.746	5.886
4000	4008	277.82	4.67	15.67	6.325	1.026	7.931	0.968	334.1	1.739	5.858
4250	4259	276.40	3.25	15.88	6.133	1.028	7.730	0.969	333.3	1.732	5.831
4500	4509	274.96	1.83	16.08	5.946	1.030	7.533	0.970	332.4	1.725	5.804
4750	4760	273.56	0.41	16.28	5.763	1.032	7.340	0.971	331.6	1.718	5.777
5000	5011	272.13	−1.02	16.48	5.586 + 2	1.034	7.151 − 1	0.971	330.7	1.711 − 5	5.750 − 6
5250	5262	270.71	−2.44	16.69	5.413	1.036	6.966	0.972	329.8	1.704	5.723
5500	5512	269.29	−3.86	16.89	5.244	1.038	6.784	0.973	329.0	1.697	5.695
5750	5763	267.87	−5.28	17.09	5.080	1.041	6.607	0.974	328.1	1.690	5.668
6000	6014	266.44	−6.71	17.29	4.920	1.043	6.433	0.975	327.2	1.683	5.641
6250	6265	264.67	−8.48	17.15	4.765	1.045	6.271	0.977	326.1	1.674	5.607
6500	6516	262.90	−10.25	17.00	4.613	1.048	6.112	0.980	325.0	1.665	5.573
6750	6766	261.13	−12.02	16.85	4.465	1.050	5.957	0.982	323.9	1.656	5.539
7000	7017	259.36	−13.79	16.71	4.321	1.052	5.804	0.984	322.8	1.647	5.504
7250	7268	257.58	−15.57	16.56	4.180	1.055	5.654	0.987	321.7	1.638	5.470
7500	7519	255.81	−17.34	16.41	4.043 + 2	1.057	5.506 − 1	0.989	320.6	1.629 − 5	5.436 − 6
7750	7770	254.04	−19.11	16.26	3.910	1.059	5.362	0.992	319.5	1.620	5.401
8000	8021	252.27	−20.88	16.12	3.781	1.062	5.221	0.994	318.4	1.611	5.367
8250	8272	250.51	−22.64	15.98	3.654	1.064	5.082	0.996	317.3	1.602	5.333
8500	8523	248.74	−24.41	15.84	3.531	1.067	4.946	0.999	316.2	1.593	5.298
8750	8774	246.98	−26.17	15.71	3.412	1.070	4.812	1.001	315.0	1.584	5.264
9000	9025	245.22	−27.93	15.57	3.295	1.072	4.681	1.004	313.9	1.574	5.229
9250	9276	243.46	−29.69	15.44	3.182	1.074	4.553	1.006	312.8	1.565	5.195
9500	9527	241.70	−31.45	15.30	3.072	1.077	4.428	1.009	311.7	1.556	5.160
9750	9778	239.94	−33.21	15.16	2.965	1.080	4.305	1.011	310.5	1.547	5.125
10000	10030	238.18	−34.97	15.03	2.861 + 2	1.082	4.185 − 1	1.014	309.4	1.537 − 5	5.091 − 6
10250	10281	236.42	−36.73	14.90	2.760	1.085	4.067	1.016	308.2	1.528	5.056
10500	10532	234.66	−38.49	14.76	2.662	1.088	3.951	1.019	307.1	1.519	5.021
10750	10783	232.91	−40.24	14.63	2.566	1.090	3.838	1.022	305.9	1.510	4.987
11000	11034	231.15	−42.00	14.50	2.473	1.093	3.728	1.024	304.8	1.500	4.952
11500	11537	227.65	−45.50	11.00	2.296	1.097	3.513	1.045	302.5	1.481	4.882
12000	12039	224.15	−49.00	7.50	2.129	1.101	3.308	1.064	300.1	1.463	4.812
12500	12542	220.65	−52.50	4.00	1.971	1.104	3.112	1.083	297.8	1.444	4.742
13000	13045	217.15	−56.00	0.50	1.823	1.104	2.925	1.102	295.4	1.424	4.672
13500	13547	213.65	−59.50	−3.00	1.684	1.104	2.746	1.119	293.0	1.405	4.601
14000	14050	210.15	−63.00	−6.50	1.554 + 2	1.102	2.576 − 1	1.131	290.6	1.386 − 5	4.530 − 6
14500	14553	206.65	−66.50	−10.00	1.432	1.099	2.413	1.151	288.2	1.366	4.459
15000	15056	203.15	−70.00	−13.50	1.317	1.096	2.258	1.166	285.7	1.346	4.388
15500	15559	203.15	−70.00	−13.50	1.211	1.088	2.076	1.160	285.7	1.346	4.388
16000	16062	203.15	−70.00	−13.50	1.113	1.082	1.909	1.154	285.7	1.346	4.388
16500	16566	204.25	−68.90	−12.40	1.024	1.077	1.766	1.142	286.5	1.353	4.411
17000	17069	205.35	−67.80	−11.30	9.417 + 1	1.072	1.598	1.131	287.3	1.359	4.433
17500	17572	206.45	−66.70	−10.20	8.667	1.067	1.463	1.120	288.0	1.365	4.455
18000	18076	207.55	−65.60	−9.10	7.981	1.063	1.340	1.110	288.8	1.371	4.478
18500	18580	208.65	−64.50	−8.00	7.352	1.060	1.228	1.101	289.6	1.377	4.500
19000	19083	209.75	−63.40	−6.90	6.776 + 1	1.057	1.125 − 1	1.091	290.3	1.383 − 5	4.522 − 6
19500	19587	210.85	−62.30	−5.80	6.247	1.055	1.032	1.083	291.1	1.390	4.545
20000	20091	211.95	−61.20	−4.70	5.762	1.052	9.471 − 2	1.076	291.9	1.396	4.567
20500	20595	213.05	−60.10	−4.10	5.317	1.051	8.694	1.071	292.6	1.402	4.589
21000	21099	214.15	−59.00	−3.50	4.908	1.049	7.985	1.066	293.4	1.408	4.611
21500	21603	215.15	−58.00	−3.00	4.533	1.048	7.340	1.063	294.0	1.413	4.631
22000	22107	216.15	−57.00	−2.50	4.188	1.047	6.749	1.059	294.7	1.419	4.652
22500	22611	217.15	−56.00	−2.00	3.870	1.046	6.209	1.056	295.4	1.424	4.672
23000	23115	218.15	−55.00	−1.50	3.578	1.045	5.714	1.053	296.1	1.430	4.692
23500	23620	219.15	−54.00	−1.00	3.309	1.045	5.260	1.050	296.8	1.435	4.712
24000	24124	220.15	−53.00	−0.50	3.062 + 1	1.045	4.845 − 2	1.047	297.4	1.441 − 5	4.732 − 6
24500	24629	221.15	−52.00	−0.00	2.833	1.045	4.463	1.045	298.1	1.446	4.752
25000	25133	222.15	−51.00	0.50	2.623	1.045	4.114	1.042	298.8	1.452	4.772
25500	25638	223.15	−50.00	1.00	2.430	1.045	3.793	1.040	299.5	1.457	4.792
26000	26143	224.15	−49.00	1.50	2.251	1.045	3.498	1.038	300.1	1.463	4.812
26500	26648	225.15	−48.00	2.00	2.086	1.046	3.228	1.037	300.8	1.468	4.832
27000	27153	226.15	−47.00	2.50	1.934	1.047	2.979	1.035	301.5	1.473	4.852
27500	27658	227.15	−46.00	3.00	1.794	1.048	2.751	1.034	302.1	1.479	4.872
28000	28163	228.15	−45.00	3.50	1.664	1.049	2.541	1.033	302.8	1.484	4.892
28500	28668	229.15	−44.00	4.00	1.544	1.050	2.348	1.032	303.5	1.489	4.912

TABLE 5.1.—*Continued*
30° N. July
GEOMETRIC ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, m	H, m'	T, °K	t, °C	$T - T_{std}$	P, mb	$\frac{P}{P_{std}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{std}}$	C_s m sec^{-1}	μ kg m^{-1} sec^{-1}	k k-cal m^{-1} sec^{-1}(°K)$^{-1}$
0	0	304.58	31.43	16.43	1.01350 + 3	1.000	1.159 + 0	0.946	349.9	1.868 − 5	6.359 − 6
250	250	302.34	29.19	15.81	9.854 + 2	1.002	1.135	0.949	348.6	1.857	6.318
500	499	300.09	26.94	15.19	9.579	1.003	1.112	0.953	347.3	1.846	6.276
750	749	297.84	24.69	14.56	9.310	1.005	1.089	0.956	346.0	1.836	6.234
1000	998	295.59	22.44	13.94	9.046	1.006	1.066	0.959	344.7	1.825	6.192
1250	1248	294.06	20.93	14.05	8.788	1.008	1.041	0.959	343.8	1.818	6.164
1500	1498	292.57	19.42	14.17	8.536	1.010	1.016	0.961	342.9	1.811	6.136
1750	1747	291.06	17.91	14.29	8.291	1.011	9.923 − 1	0.962	342.0	1.803	6.108
2000	1997	289.56	16.41	14.40	8.051	1.013	9.686	0.962	341.1	1.796	6.079
2250	2246	288.10	14.95	14.57	7.817	1.014	9.452	0.963	340.3	1.789	6.052
2500	2496	286.65	13.50	14.75	7.588 + 2	1.016	9.222 − 1	0.964	339.4	1.782 − 5	6.025 − 6
2750	2745	285.20	12.05	14.92	7.365	1.018	8.997	0.964	338.5	1.775	5.998
3000	2994	283.75	10.60	15.09	7.148	1.019	8.776	0.965	337.7	1.768	5.970
3250	3244	282.28	9.13	15.24	6.936	1.021	8.560	0.966	336.8	1.761	5.942
3500	3493	280.81	7.66	15.40	6.729	1.023	8.348	0.967	335.9	1.754	5.915
3750	3743	279.34	6.19	15.55	6.528	1.025	8.141	0.968	335.1	1.747	5.887
4000	3992	277.87	4.72	15.70	6.331	1.027	7.937	0.969	334.2	1.739	5.859
4250	4241	276.45	3.30	15.91	6.139	1.029	7.737	0.969	333.3	1.732	5.832
4500	4491	275.03	1.88	16.11	5.953	1.031	7.540	0.970	332.5	1.725	5.805
4750	4740	273.61	0.46	16.32	5.771	1.033	7.347	0.971	331.6	1.718	5.778
5000	4989	272.20	−0.95	16.52	5.593 + 2	1.035	7.159 − 1	0.972	330.7	1.711 − 5	5.751 − 6
5250	5238	270.78	−2.37	16.72	5.421	1.037	6.974	0.973	329.9	1.704	5.724
5500	5488	269.36	−3.79	16.93	5.254	1.039	6.793	0.974	329.0	1.697	5.697
5750	5737	267.94	−5.21	17.13	5.089	1.041	6.616	0.975	328.1	1.690	5.670
6000	5986	266.52	−6.63	17.34	4.929	1.044	6.443	0.976	327.3	1.683	5.642
6250	6235	264.78	−8.37	17.21	4.774	1.046	6.281	0.979	326.2	1.674	5.609
6500	6484	263.01	−10.14	17.07	4.622	1.049	6.122	0.981	325.1	1.665	5.575
6750	6734	261.24	−11.91	16.92	4.474	1.051	5.967	0.983	324.0	1.657	5.541
7000	6983	259.48	−13.67	16.78	4.331	1.054	5.814	0.985	322.9	1.648	5.507
7250	7232	257.71	−15.44	16.63	4.190	1.056	5.664	0.988	321.8	1.639	5.473
7500	7481	255.95	−17.20	16.49	4.054 + 2	1.058	5.518 − 1	0.990	320.7	1.630 − 5	5.438 − 6
7750	7730	254.18	−18.97	16.34	3.921	1.061	5.376	0.993	319.6	1.621	5.404
8000	7979	252.41	−20.74	16.20	3.791	1.063	5.232	0.995	318.5	1.612	5.370
8250	8228	250.66	−22.49	16.06	3.665	1.066	5.094	0.998	317.4	1.603	5.336
8500	8477	248.91	−24.24	15.93	3.542	1.069	4.958	1.000	316.3	1.593	5.301
8750	8726	247.15	−26.00	15.80	3.423	1.071	4.825	1.003	315.2	1.584	5.267
9000	8975	245.40	−27.75	15.67	3.307	1.074	4.694	1.005	314.0	1.575	5.233
9250	9224	243.65	−29.50	15.53	3.194	1.076	4.567	1.008	312.9	1.566	5.198
9500	9473	241.89	−31.26	15.40	3.084	1.079	4.441	1.010	311.8	1.557	5.164
9750	9722	240.14	−33.01	15.27	2.977	1.081	4.319	1.013	310.7	1.548	5.129
10000	9971	238.39	−34.76	15.13	2.873 + 2	1.084	4.199 − 1	1.015	309.5	1.539 − 5	5.095 − 6
10250	10219	236.64	−36.51	15.00	2.772	1.087	4.081	1.018	308.4	1.529	5.060
10500	10468	234.89	−38.26	14.87	2.674	1.090	3.966	1.020	307.2	1.520	5.026
10750	10717	233.14	−40.01	14.74	2.578	1.093	3.853	1.023	306.1	1.511	4.991
11000	10966	231.39	−41.76	14.61	2.486	1.095	3.742	1.026	304.9	1.501	4.956
11500	11464	227.90	−45.25	11.25	2.308	1.100	3.529	1.046	302.6	1.483	4.887
12000	11961	224.42	−48.73	7.77	2.141	1.104	3.324	1.066	300.3	1.464	4.818
12500	12458	220.94	−52.21	4.29	1.984	1.107	3.128	1.085	298.0	1.445	4.748
13000	12956	217.46	−55.69	0.81	1.836	1.107	2.941	1.103	295.6	1.426	4.678
13500	13453	213.98	−59.17	−2.67	1.697	1.107	2.763	1.123	293.2	1.407	4.608
14000	13950	210.50	−62.65	−6.15	1.566 + 2	1.105	2.592 − 1	1.138	290.9	1.388 − 5	4.538 − 6
14500	14447	207.02	−66.13	−9.63	1.444	1.102	2.430	1.154	288.4	1.368	4.467
15000	14944	203.54	−69.61	−13.11	1.329	1.098	2.275	1.168	286.0	1.349	4.396
15500	15441	203.15	−70.00	−13.50	1.223	1.092	2.097	1.164	285.7	1.346	4.388
16000	15938	203.15	−70.00	−13.50	1.125	1.087	1.929	1.159	285.7	1.346	4.388
16500	16435	204.11	−69.04	−12.54	1.035	1.081	1.766	1.148	286.4	1.352	4.408
17000	16931	205.20	−67.95	−11.45	9.525 + 1	1.076	1.617	1.136	287.2	1.358	4.430
17500	17428	206.29	−66.86	−10.36	8.771	1.072	1.481	1.126	287.9	1.364	4.452
18000	17925	207.38	−65.77	−9.27	8.081	1.068	1.357	1.116	288.7	1.370	4.474
18500	18421	208.48	−64.67	−8.17	7.448	1.065	1.245	1.106	289.4	1.376	4.497
19000	18917	209.57	−63.58	−7.08	6.867 + 1	1.062	1.142 − 1	1.098	290.2	1.382 − 5	4.519 − 6
19500	19414	210.66	−62.49	−5.99	6.335	1.059	1.048	1.089	291.0	1.388	4.541
20000	19910	211.75	−61.40	−4.90	5.846	1.057	9.618 − 2	1.082	291.7	1.395	4.563
20500	20406	212.84	−60.31	−4.24	5.398	1.056	8.835	1.077	292.5	1.401	4.585
21000	20902	213.93	−59.22	−3.65	4.986	1.054	8.119	1.072	293.2	1.407	4.607
21500	21398	214.95	−58.20	−3.13	4.607	1.053	7.466	1.068	293.9	1.412	4.627
22000	21894	215.94	−57.21	−2.64	4.258	1.052	6.870	1.065	294.6	1.418	4.647
22500	22390	216.93	−56.22	−2.14	3.938	1.051	6.324	1.062	295.3	1.423	4.667
23000	22886	217.92	−55.23	−1.65	3.643	1.051	5.823	1.059	295.9	1.429	4.687
23500	23381	218.91	−54.24	−1.15	3.371	1.050	5.364	1.056	296.6	1.434	4.707
24000	23877	219.90	−53.25	−0.66	3.121 + 1	1.050	4.944 − 2	1.053	297.3	1.439 − 5	4.727 − 6
24500	24372	220.89	−52.26	−0.16	2.890	1.050	4.558	1.051	297.9	1.445	4.747
25000	24868	221.88	−51.27	0.33	2.677	1.050	4.203	1.049	298.6	1.450	4.767
25500	25363	222.88	−50.27	0.83	2.481	1.050	3.878	1.047	299.2	1.456	4.787
26000	25858	223.87	−49.28	1.32	2.300	1.051	3.579	1.045	299.7	1.461	4.807
26500	26354	224.86	−48.29	1.82	2.133	1.052	3.305	1.043	300.6	1.466	4.826
27000	26849	225.85	−47.30	2.31	1.979	1.053	3.052	1.042	301.3	1.472	4.846
27500	27344	226.84	−46.31	2.80	1.836	1.054	2.820	1.041	301.9	1.477	4.866
28000	27839	227.83	−45.32	3.30	1.705	1.055	2.607	1.039	302.6	1.482	4.886
28500	28334	228.82	−44.33	3.79	1.583	1.056	2.410	1.038	303.2	1.488	4.905

TABLE 5.1.—*Continued*
30° N. July
GEOPOTENTIAL ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, m'	Z, m	T, °K	t, °C	$T-T_{std}$	P, mb	$\frac{P}{P_{std}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{std}}$	C_s m sec^{-1}	μ kg m^{-1} sec^{-1}	k k-cal m^{-1} sec^{-1}(°K)$^{-1}$
29000	29173	230.15	-43.00	4.50	1.434	+ 1	1.052	2.170 - 2	1.031	304.1	1.495 - 5	4.932 - 6
29500	29679	231.15	-42.00	5.00	1.331		1.053	2.006	1.030	304.8	1.500	4.952
30000	30184	232.15	-41.00	5.50	1.237		1.055	1.856	1.030	305.4	1.506	4.971
30500	30689	233.15	-40.00	6.00	1.149		1.057	1.717	1.030	306.1	1.511	4.991
31000	31195	234.15	-39.00	6.50	1.068		1.060	1.589	1.030	306.8	1.516	5.011
31500	31701	235.15	-38.00	7.00	9.930	+ 0	1.062	1.471	1.030	307.4	1.521	5.031
32000	32206	236.15	-37.00	7.50	9.236		1.064	1.362	1.031	308.1	1.527	5.051
33000	33218	238.55	-34.60	7.10	7.998		1.069	1.168	1.037	309.6	1.539	5.098
34000	34230	240.95	-32.20	6.70	6.936		1.073	1.003	1.044	311.2	1.552	5.145
35000	35243	243.35	-29.80	6.30	6.023		1.078	8.422 - 3	1.050	312.7	1.565	5.193
36000	36255	245.75	-27.40	5.90	5.238	+ 0	1.081	7.425 - 3	1.056	314.3	1.577 - 5	5.240 - 6
37000	37268	248.15	-25.00	5.50	4.561		1.085	6.603	1.061	315.8	1.590	5.287
38000	38282	250.55	-22.60	5.10	3.977		1.088	5.930	1.066	317.3	1.602	5.333
39000	39295	252.95	-20.20	4.70	3.472		1.091	4.782	1.071	318.8	1.614	5.380
40000	40309	255.35	-17.80	4.30	3.036		1.095	4.141	1.075	320.3	1.627	5.427
41000	41322	257.75	-15.40	3.90	2.657		1.098	3.591	1.080	321.8	1.639	5.473
42000	42338	260.15	-13.00	3.50	2.329		1.098	3.118	1.084	323.3	1.651	5.520
43000	43353	262.55	-10.60	3.10	2.043		1.100	2.711	1.087	324.8	1.663	5.566
44000	44368	264.95	-8.20	2.70	1.795		1.102	2.360	1.091	326.3	1.675	5.612
45000	45384	267.35	-5.80	2.30	1.579		1.105	2.057	1.094	327.8	1.687	5.658
46000	46400	269.75	-3.40	1.90	1.390	+ 0	1.104	1.795 - 3	1.096	329.2	1.699 - 5	5.704 - 6
47000	47416	272.15	-1.00	1.50	1.226		1.105	1.569	1.099	330.7	1.711	5.750
48000	48433	272.15	-1.00	1.50	1.081		1.104	1.384	1.100	330.7	1.711	5.750
49000	49449	272.15	-1.00	1.50	9.534	- 1	1.107	1.220	1.101	330.7	1.711	5.750
50000	50467	272.15	-1.00	1.50	8.410		1.107	1.076	1.101	330.7	1.711	5.750
51000	51484	272.15	-1.00	1.50	7.418		1.108	9.495 - 4	1.102	330.7	1.711	5.750
52000	52502	270.15	-3.00	-0.50	6.539		1.108	8.433	1.110	329.5	1.701	5.712
53000	53520	268.15	-5.00	-0.50	5.760		1.108	7.483	1.110	328.3	1.691	5.674
54000	54539	266.15	-7.00	-0.50	5.068		1.108	6.634	1.110	327.0	1.681	5.635
55000	55558	264.15	-9.00	-0.50	4.456		1.108	5.876	1.110	325.8	1.671	5.597
56000	56577	262.15	-11.00	-0.50	3.913	- 1	1.107	5.200 - 4	1.110	324.6	1.661 - 5	5.558 - 6
57000	57596	260.15	-13.00	-0.50	3.433		1.107	4.598	1.109	323.3	1.651	5.520
58000	58616	258.15	-15.00	-0.50	3.009		1.107	4.061	1.109	322.1	1.641	5.481
59000	59636	256.15	-17.00	-0.50	2.639		1.107	3.584	1.109	320.8	1.631	5.442
60000	60656	252.35	-20.80	-2.30	2.304		1.105	3.184	1.114	318.5	1.611	5.368
61000	61677	248.55	-24.60	-4.10	2.010		1.104	2.817	1.122	316.0	1.592	5.294
62000	62698	244.75	-28.40	-3.90	1.750		1.101	2.491	1.119	313.6	1.572	5.220
63000	63720	240.95	-32.20	-3.70	1.520		1.099	2.198	1.116	311.2	1.552	5.145
64000	64741	237.15	-36.00	-3.50	1.318		1.096	1.936	1.113	308.7	1.532	5.070
65000	65764	233.35	-39.80	-3.30	1.140		1.095	1.701	1.110	306.2	1.512	4.995
66000	66786	229.55	-43.60	-3.10	9.833	- 2	1.092	1.492 - 4	1.107	303.7	1.492 - 5	4.920 - 6
67000	67809	225.75	-47.40	-2.90	8.467		1.092	1.306	1.104	301.2	1.471	4.844
68000	68832	221.95	-51.20	-2.70	7.265		1.088	1.140	1.101	298.7	1.451	4.768
69000	69855	218.15	-55.00	-2.50	6.220		1.086	9.933 - 5	1.098	296.1	1.430	4.692
70000	70879	214.35	-58.80	-2.30	5.311		1.084	8.632	1.096	293.5	1.409	4.615
71000	71903	210.55	-62.60	-2.10	4.522		1.082	7.482	1.093	290.9	1.388	4.539
72000	72927	206.75	-66.40	-1.90	3.839		1.081	6.469	1.090	288.2	1.367	4.461
73000	73952	202.95	-70.20	-1.70	3.249		1.079	5.578	1.088	285.6	1.345	4.384
74000	74977	199.15	-74.00	-1.50	2.742		1.078	4.796	1.086	282.9	1.324	4.307
75000	76002	195.35	-77.80	-1.30	2.306		1.076	4.112	1.083	280.2	1.302	4.229
76000	77028	191.55	-81.60	-1.10	1.932	- 2	1.075	3.514 - 5	1.081	277.5	1.280 - 5	4.151 - 6
77000	78054	187.75	-85.40	-0.90	1.614		1.074	2.994	1.079	274.7	1.258	4.072
78000	79080	183.95	-89.20	-0.70	1.343		1.073	2.543	1.078	271.9	1.236	3.994
79000	80107	180.15	-93.00	-0.50	1.113		1.072	2.152	1.076	269.1	1.213	3.915
80000	81134	176.39	-96.81	-4.31	9.189	- 3	1.070	1.815	1.096	266.2	1.191	3.836
81000	82161	172.62	-100.63	-8.13	7.555		1.063	1.525	1.113	263.3	1.168	3.756
82000	83189	172.61	-100.64	-8.14	6.198		1.053	1.251	1.102	263.3	1.168	3.756
83000	84217	172.63	-100.65	-8.15	5.084		1.044	1.027	1.093	263.3	1.168	3.756
84000	85245	172.64	-100.66	-8.16	4.171		1.035	8.421 - 6	1.083	263.3	1.168	3.756
85000	86274	172.67	-100.68	-8.18	3.422		1.026	6.909	1.074	263.3	1.168	3.756
86000	87303	172.66	-100.69	-8.19	2.807	- 3	1.016	5.668 - 6	1.064	263.3	1.168 - 5	3.756 - 6
87000	88332	172.65	-100.70	-8.20	2.303		1.007	4.650	1.055	263.3	1.168	3.756
88000	89361	172.64	-100.71	-8.21	1.889		0.999	3.814	1.046	263.3	1.168	3.756
89000	90391	172.64	-100.81	-8.10	1.550		0.990	3.129	1.041	263.3	1.168	3.756
90000	91422	174.50	-98.95	-10.01	1.273		0.980	2.535	1.034	265.2	1.182	3.807
92000	93483	178.80	-94.35	-11.81	8.662	- 4	0.960	1.679	1.018	268.8	1.211	3.907
94000	95546	182.81	-90.34	-13.90	5.952		0.938	1.124	1.001	272.3	1.239	4.006
96000	97610	186.16	-86.99	-16.40	4.130		0.916	7.598 - 7	0.982	275.9	1.267	4.105
98000	99676	189.51	-83.64	-19.20	2.892		0.894	5.189	0.963	279.3	1.295	4.204
100000	101742	192.95	-80.20	-24.05	2.043		0.869	3.577	0.955	282.6	1.323	4.302
102000	103811	197.40	-75.75	-19.79	1.469	- 4	0.848	2.471 - 7	0.900	286.5	1.417 - 5	4.643 - 6
104000	105880	202.02	-71.13	-14.74	1.083		0.838	1.822	0.862	305.8	1.508	4.982
106000	107951	207.31	-65.84	-9.62	8.157	- 5	0.834	1.139	0.835	316.7	1.597	5.313
108000	110023	211.76	-61.49	-4.54	6.258		0.837	8.184 - 6	0.817	327.2	1.682	5.640
110000	112096	216.43	-56.72	-3.84	4.880		0.841	6.002	0.831	337.4	1.766	5.961
112000	114171	220.43	-52.72	1.86	3.885		0.847	4.273	0.804	346.8	1.924	6.586
114000	116247	224.26	-48.89	12.50	3.145		0.860	3.147	0.789	355.2	2.075	7.186
116000	118325	228.92	-44.23	23.20	2.627		0.877	2.384	0.782	362.8	2.219	7.770

TABLE 5.1.—*Continued*
30° N. July
GEOMETRIC ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, m	H, m	T, °K	t, °C	$T-T_{std}$	P, mb	$\frac{P}{P_{std}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{std}}$	C_s m sec^{-1}	μ kg m^{-1} sec^{-1}	$\frac{k}{\text{k-cal m}^{-1}\text{ sec}^{-1}(°K)^{-1}}$
29000	28829	229.81	-43.34	4.29	1.476 + 1	1.058	2.229 - 2	1.038	303.9	1.493 - 5	4.925 - 6
29500	29323	230.80	-42.35	4.78	1.366	1.059	2.062	1.037	304.6	1.498	4.945
30000	29816	231.79	-41.36	5.28	1.270	1.061	1.909	1.037	305.2	1.504	4.964
30500	30313	232.77	-40.38	5.77	1.181	1.063	1.768	1.037	305.9	1.509	4.984
31000	30807	233.76	-39.39	6.26	1.099	1.065	1.637	1.037	306.5	1.514	5.003
31500	31302	234.75	-38.40	6.76	1.022	1.068	1.517	1.037	307.1	1.519	5.023
32000	31796	235.74	-37.41	7.25	9.513 + 0	1.070	1.406	1.037	307.8	1.525	5.043
33000	32784	238.03	-35.12	7.06	8.249	1.075	1.207	1.043	309.3	1.537	5.088
34000	33773	240.40	-32.75	7.66	7.163	1.080	1.038	1.050	310.8	1.549	5.135
35000	34760	242.77	-30.38	8.26	6.229	1.084	8.939 - 3	1.056	312.4	1.562	5.181
36000	35748	245.14	-28.01	8.86	5.425 + 0	1.088	7.709 - 3	1.062	313.9	1.574 - 5	5.228 - 6
37000	36735	247.51	-25.64	9.46	4.731	1.092	6.658	1.068	315.4	1.586	5.274
38000	37722	249.88	-23.27	9.06	4.131	1.095	5.759	1.073	316.9	1.599	5.320
39000	38709	252.25	-20.90	9.67	3.612	1.098	4.988	1.078	318.4	1.611	5.367
40000	39695	254.62	-18.53	9.27	3.162	1.101	4.326	1.083	319.9	1.623	5.413
41000	40681	256.98	-16.17	8.87	2.772	1.104	3.758	1.087	321.4	1.635	5.458
42000	41667	259.35	-13.80	8.47	2.433	1.106	3.268	1.091	322.8	1.647	5.504
43000	42652	261.71	-11.44	8.07	2.138	1.108	2.846	1.095	324.3	1.659	5.550
44000	43637	264.08	-9.07	7.68	1.881	1.110	2.482	1.099	325.8	1.671	5.595
45000	44622	266.44	-6.71	7.28	1.657	1.111	2.167	1.102	327.2	1.683	5.641
46000	45606	268.80	-4.35	6.88	1.461 + 0	1.113	1.894 - 3	1.105	328.7	1.694 - 5	5.686 - 6
47000	46591	271.17	-1.98	7.48	1.290	1.114	1.658	1.108	330.1	1.706	5.731
48000	47575	273.15	-1.00	7.50	1.140	1.115	1.460	1.108	330.7	1.711	5.750
49000	48558	273.15	-1.00	7.50	1.008	1.116	1.290	1.109	330.7	1.711	5.750
50000	49541	273.15	-1.00	7.50	8.906 - 1	1.117	1.140	1.110	330.7	1.711	5.750
51000	50524	273.15	-1.00	7.50	7.874	1.118	1.008	1.111	330.7	1.711	5.750
52000	51507	271.14	-2.01	6.49	6.959	1.118	8.942 - 4	1.116	330.1	1.706	5.731
53000	52489	269.17	-3.98	5.36	6.146	1.119	7.955	1.120	328.9	1.696	5.693
54000	53471	267.21	-5.94	4.35	5.424	1.119	7.071	1.120	327.7	1.687	5.655
55000	54453	265.24	-7.91	3.35	4.782	1.119	6.280	1.120	326.5	1.677	5.618
56000	55434	263.28	-9.87	2.35	4.212 - 1	1.118	5.573 - 4	1.120	325.3	1.667 - 5	5.580 - 6
57000	56415	261.32	-11.83	1.34	3.707	1.119	4.942	1.120	324.1	1.657	5.542
58000	57396	259.36	-13.79	0.34	3.259	1.118	4.378	1.120	322.8	1.647	5.504
59000	58377	257.40	-15.75	-0.34	2.863	1.119	3.875	1.120	321.6	1.637	5.466
60000	59357	254.79	-18.36	-0.98	2.512	1.119	3.435	1.123	320.0	1.624	5.416
61000	60337	251.07	-22.08	-2.74	2.201	1.118	3.054	1.130	317.6	1.605	5.344
62000	61316	247.35	-25.80	-3.70	1.924	1.116	2.710	1.133	315.3	1.585	5.271
63000	62295	243.63	-29.52	-3.50	1.679	1.113	2.401	1.130	312.9	1.566	5.198
64000	63274	239.91	-33.24	-3.30	1.462	1.112	2.123	1.127	310.5	1.547	5.125
65000	64253	236.19	-36.96	[illegible]	1.271	1.110	1.874	1.125	308.1	1.527	5.051
66000	65231	232.47	-40.6		1.102 - 1	1.108	1.651 - 4	1.122	305.7	1.507 - 5	4.978 - 6
67000	66209	228.75	-44.4	[illegible]	9.535 - 2	1.107	1.451	1.120	303.2	1.487	4.904
68000	67187	225.04	-48.11	-2.49	8.226	1.105	1.273	1.117	300.7	1.467	4.830
69000	68164	221.32	-51.83	-2.29	7.083	1.103	1.115	1.115	298.2	1.447	4.756
70000	69142	217.61	-55.54	-2.09	6.083	1.102	9.739 - 5	1.113	295.7	1.427	4.681
71000	70118	213.90	-59.25	-1.89	5.212	1.101	8.488	1.110	293.2	1.406	4.606
72000	71095	210.19	-62.96	-1.69	4.453	1.099	7.380	1.108	290.6	1.386	4.531
73000	72071	206.48	-66.67	-1.49	3.794	1.099	6.402	1.106	288.1	1.365	4.456
74000	73047	202.77	-70.38	-1.29	3.224	1.097	5.539	1.104	285.5	1.344	4.381
75000	74023	199.06	-74.09	-1.09	2.731	1.097	4.779	1.102	282.8	1.323	4.305
76000	74998	195.36	-77.79	-0.88	2.306 - 2	1.096	4.113 - 5	1.101	280.2	1.302 - 5	4.229 - 6
77000	75973	191.65	-81.50	-0.69	1.942	1.096	3.529	1.100	277.5	1.281	4.153
78000	76948	187.95	-85.20	-0.48	1.629	1.095	3.020	1.098	274.8	1.259	4.076
79000	77922	[illegible]	-88.90	-0.28	1.362	1.095	2.576	1.097	272.1	1.238	4.000
80000	78896	[illegible]	-92.61	-0.11	1.135	1.095	2.190	1.096	269.4	1.216	3.923
81000	79870	[illegible]	-96.32	-3.82	9.423 - 3	1.093	1.856	1.117	266.6	1.194	3.846
82000	80843	[illegible]	-100.03	-7.53	7.792	1.087	1.568	1.134	263.8	1.172	3.769
83000	81816	[illegible]	-103.74	-8.14	6.427	1.078	1.298	1.128	263.3	1.168	3.756
84000	82789	[illegible]	-103.76	-8.15	5.301	1.069	1.070	1.119	263.3	1.168	3.756
85000	83762	[illegible]	-103.80	-8.16	4.373	1.060	8.828 - 6	1.110	263.3	1.168	3.756
86000	84734	[illegible]	-103.87	-8.17	3.607 - 3	1.051	7.282 - 6	1.101	263.3	1.168 - 5	3.756 - 6
87000	85706	[illegible]	-103.93	-8.18	2.975	1.043	6.007	1.091	263.3	1.168	3.756
88000	86678	[illegible]	-103.70	-8.20	2.455	1.034	4.956	1.082	263.3	1.168	3.756
89000	87649	[illegible]	-103.71	-8.21	2.025	1.025	4.089	1.073	263.3	1.168	3.756
90000	88620	[illegible]	-103.72	-8.22	1.671	1.016	3.374	1.064	263.3	1.168	3.756
92000	90561	[illegible]	-97.44	-10.91	1.142	0.997	2.256	1.056	266.4	1.190	3.835
94000	92501	[illegible]	-93.27	-12.68	7.877 - 4	0.976	1.516	1.039	269.7	1.218	3.932
96000	94440	[illegible]	-89.09	-14.90	5.488	0.955	1.030	1.022	273.1	1.245	4.028
98000	96378	[illegible]	-84.93	-17.46	3.859	0.932	7.065 - 7	1.003	276.5	1.273	4.124
100000	98314	[illegible]	-80.12	-19.99	2.737	0.910	4.892	0.983	279.9	1.299	4.220
102000	100249	[illegible]	-76.43	-24.94	1.958 - 4	0.865	3.392 - 7	0.971	284.2	1.335 - 5	4.345 - 6
104000	102183	[illegible]	-69.99	-20.06	1.427	0.865	2.288	0.918	295.5	1.425	4.676
106000	104116	[illegible]	-64.89	-15.11	1.065	0.855	1.588	0.880	306.4	1.513	5.001
108000	106047	[illegible]	-53.97	-10.19	8.104 - 5	0.851	1.130	0.854	316.9	1.599	5.321
110000	107978	[illegible]	-51.41	-5.26	6.278	0.853	8.213 - 8	0.836	327.1	1.681	5.636
112000	109907	[illegible]	-47.43	-10.13	4.935	0.857	6.087	0.851	336.9	1.762	5.946
114000	111835	[illegible]	-43.31	-0.50	3.955	0.861	4.388	0.825	346.2	1.912	6.533
116000	113762	[illegible]	-44.07	0.71	3.240	0.872	3.259	0.808	374.1	2.057	7.116
118000	115687	[illegible]	-46.1	19.97	2.702	0.868	2.486	0.799	390.1	2.197	7.680

TABLE 5.1.—*Continued*
45° N. January
GEOPOTENTIAL ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, m'	Z, m	T, °K	t, °C	$T-T_{std}$	P, mb	$\frac{P}{P_{std}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{std}}$	C_s, m sec^{-1}	μ, kg m^{-1} sec^{-1}	k, kcal m^{-1} sec^{-1}(°K)$^{-1}$
0	0	272.99	+0.56	−15.56	1.01800 + 3	1.005	1.301 + 0	1.062	331.0	1.713 − 5	5.759 − 6
250	250	271.69	−1.46	−14.83	9.865 + 2	1.003	1.265	1.058	330.4	1.709	5.741
500	500	270.80	−2.35	−14.10	9.560	1.001	1.230	1.054	329.9	1.704	5.724
750	750	269.90	−3.25	−13.38	9.262	1.000	1.196	1.050	329.3	1.700	5.707
1000	1000	269.00	−4.15	−12.65	8.973	0.998	1.162	1.045	328.8	1.695	5.690
1250	1250	268.11	−5.04	−11.92	8.693	0.997	1.129	1.041	328.2	1.691	5.673
1500	1500	267.21	−5.94	−11.19	8.420	0.996	1.098	1.037	327.7	1.687	5.656
1750	1750	266.32	−6.83	−10.46	8.154	0.995	1.067	1.034	327.1	1.682	5.638
2000	2001	265.43	−7.72	−9.72	7.896	0.993	1.036	1.030	326.6	1.678	5.621
2250	2251	264.53	−8.62	−8.99	7.646	0.992	1.007	1.026	326.1	1.673	5.604
2500	2501	263.64	−9.51	−8.26	7.403 + 2	0.991	9.782 − 1	1.022	325.5	1.669 − 5	5.587 − 6
2750	2751	262.74	−10.41	−7.53	7.166	0.990	9.502	1.019	324.9	1.664	5.570
3000	3001	261.85	−11.30	−6.80	6.937	0.989	9.229	1.015	324.4	1.660	5.552
3250	3252	260.33	−12.82	−6.69	6.713	0.989	8.964	1.014	323.5	1.652	5.523
3500	3502	258.81	−14.34	−6.59	6.496	0.988	8.744	1.013	322.5	1.644	5.494
3750	3752	257.29	−15.86	−6.48	6.285	0.987	8.509	1.012	321.6	1.636	5.464
4000	4003	255.77	−17.38	−6.38	6.079	0.986	8.280	1.011	320.6	1.629	5.435
4250	4253	254.26	−18.89	−6.26	5.879	0.985	8.054	1.010	319.7	1.621	5.406
4500	4503	252.75	−20.40	−6.15	5.684	0.985	7.834	1.009	318.7	1.613	5.376
4750	4754	251.25	−21.90	−6.03	5.494	0.984	7.618	1.007	317.8	1.606	5.347
5000	5004	249.74	−23.41	−5.91	5.310 + 2	0.983	7.408 − 1	1.006	316.8	1.598 − 5	5.318 − 6
5250	5254	248.23	−24.92	−5.80	5.131	0.982	7.201	1.005	315.8	1.590	5.288
5500	5505	246.72	−26.43	−5.68	4.957	0.981	7.000	1.004	314.9	1.582	5.259
5750	5755	245.21	−27.94	−5.57	4.788	0.981	6.802	1.003	313.9	1.574	5.229
6000	6006	243.70	−29.45	−5.45	4.624	0.980	6.609	1.002	312.9	1.566	5.199
6250	6256	242.19	−30.96	−5.33	4.464	0.979	6.421	1.001	312.0	1.559	5.170
6500	6507	240.69	−32.46	−5.21	4.309	0.979	6.236	1.000	311.0	1.551	5.140
6750	6757	239.19	−33.96	−5.09	4.158	0.978	6.056	0.999	310.0	1.543	5.111
7000	7008	237.68	−35.47	−4.97	4.012	0.977	5.880	0.997	309.1	1.535	5.081
7250	7258	236.18	−36.97	−4.85	3.870	0.976	5.708	0.996	308.1	1.527	5.051
7500	7509	234.67	−38.48	−4.73	3.732 + 2	0.976	5.540 − 1	0.995	307.1	1.519 − 5	5.021 − 6
7750	7759	233.17	−39.98	−4.61	3.598	0.975	5.376	0.994	306.1	1.511	4.992
8000	8010	231.66	−41.49	−4.49	3.468	0.974	5.215	0.993	305.1	1.503	4.962
8250	8261	230.16	−42.99	−4.36	3.342	0.974	5.059	0.992	304.1	1.495	4.932
8500	8511	228.66	−44.49	−4.24	3.220	0.973	4.906	0.991	303.1	1.487	4.902
8750	8762	227.16	−45.99	−4.11	3.102	0.972	4.757	0.990	302.1	1.479	4.872
9000	9013	225.66	−47.49	−3.99	2.987	0.972	4.611	0.989	301.1	1.471	4.842
9250	9263	224.16	−48.99	−3.87	2.876	0.971	4.469	0.988	300.1	1.463	4.812
9500	9514	222.66	−50.49	−3.74	2.768	0.970	4.330	0.987	299.1	1.454	4.782
9750	9765	221.16	−51.99	−3.62	2.663	0.970	4.195	0.986	298.1	1.446	4.752
10000	10016	219.65	−53.50	−3.50	2.562 + 2	0.969	4.063 − 1	0.985	297.1	1.438 − 5	4.722 − 6
10250	10267	219.53	−53.62	−2.00	2.464	0.969	3.911	0.977	297.0	1.437	4.720
10500	10517	219.40	−53.75	−0.50	2.370	0.969	3.763	0.971	296.9	1.437	4.717
10750	10768	219.28	−53.87	1.00	2.280	0.968	3.622	0.964	296.9	1.436	4.715
11000	11019	219.15	−54.00	2.50	2.193	0.969	3.485	0.958	296.8	1.435	4.712
11500	11521	218.90	−54.25	2.25	2.028	0.969	3.228	0.960	296.5	1.434	4.707
12000	12023	218.65	−54.50	2.00	1.876	0.970	2.989	0.962	296.4	1.433	4.702
12500	12525	218.40	−54.75	1.75	1.735	0.971	2.767	0.963	296.3	1.431	4.697
13000	13027	218.15	−55.00	1.50	1.604	0.972	2.562	0.965	296.1	1.430	4.692
13500	13529	217.90	−55.25	1.25	1.483	0.972	2.371	0.966	295.9	1.428	4.687
14000	14031	217.65	−55.50	1.00	1.371 + 2	0.973	2.195 − 1	0.968	295.7	1.427 − 5	4.682 − 6
14500	14533	217.40	−55.75	0.75	1.268	0.973	2.032	0.969	295.6	1.426	4.677
15000	15035	217.15	−56.00	0.50	1.172	0.973	1.880	0.971	295.4	1.424	4.672
15500	15538	216.90	−56.25	0.25	1.083	0.973	1.740	0.972	295.2	1.423	4.667
16000	16040	216.65	−56.50	−0.00	1.001	0.973	1.610	0.973	295.1	1.422	4.662
16500	16543	216.40	−56.75	−0.25	9.252 + 1	0.973	1.489	0.974	294.9	1.420	4.657
17000	17046	216.15	−57.00	−0.50	8.549	0.973	1.378	0.975	294.7	1.419	4.652
17500	17548	215.90	−57.25	−0.75	7.899	0.973	1.275	0.976	294.6	1.417	4.647
18000	18051	215.65	−57.50	−1.00	7.298	0.972	1.179	0.977	294.4	1.416	4.642
18500	18554	215.40	−57.75	−1.25	6.742	0.972	1.090	0.978	294.2	1.415	4.637
19000	19057	215.15	−58.00	−1.50	6.228 + 1	0.972	1.008 − 1	0.978	294.0	1.413 − 5	4.631 − 6
19500	19560	215.15	−58.00	−1.50	5.752	0.971	9.314 − 2	0.978	294.0	1.413	4.631
20000	20063	215.15	−58.00	−1.50	5.313	0.970	8.603	0.977	294.0	1.413	4.631
20500	20566	215.15	−58.00	−2.00	4.908	0.970	7.947	0.979	294.0	1.413	4.631
21000	21070	215.15	−58.00	−2.50	4.533	0.969	7.340	0.980	294.0	1.413	4.631
21500	21573	215.15	−58.00	−3.00	4.187	0.968	6.780	0.982	294.0	1.413	4.631
22000	22076	215.15	−58.00	−3.50	3.868	0.967	6.263	0.983	294.0	1.413	4.631
22500	22580	215.15	−58.00	−4.00	3.573	0.966	5.785	0.984	294.0	1.413	4.631
23000	23084	215.15	−58.00	−4.50	3.300	0.964	5.343	0.984	294.0	1.413	4.631
23500	23587	215.15	−58.00	−5.00	3.048	0.962	4.935	0.985	294.0	1.413	4.631
24000	24091	215.15	−58.00	−5.50	2.815 + 1	0.961	4.559 − 2	0.985	294.0	1.413 − 5	4.631 − 6
24500	24595	215.15	−58.00	−6.00	2.600	0.959	4.211	0.985	294.0	1.413	4.631
25000	25099	215.15	−58.00	−6.50	2.402	0.957	3.889	0.985	294.0	1.413	4.631
25500	25603	215.15	−58.00	−7.00	2.219	0.954	3.592	0.985	294.0	1.413	4.631
26000	26107	215.15	−58.00	−7.50	2.049	0.952	3.318	0.985	294.0	1.413	4.631
26500	26611	215.15	−58.00	−8.00	1.893	0.949	3.065	0.985	294.0	1.413	4.631
27000	27115	215.15	−58.00	−8.50	1.748	0.947	2.831	0.984	294.0	1.413	4.631
27500	27619	215.55	−57.60	−8.00	1.615	0.943	2.610	0.981	294.3	1.416	4.640
28000	28124	215.95	−57.20	−8.70	1.492	0.941	2.407	0.979	294.6	1.418	4.648
28500	28628	216.35	−56.80	−8.80	1.379	0.938	2.220	0.976	294.9	1.420	4.656

TABLE 5.1.—*Continued*
45° N. January
GEOMETRIC ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, m	H, m	T, °K	t, °C	$T-T_{45}$	P, mb	$\frac{P}{P_{sea}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{sea}}$	C_s, m sec^{-1}	μ, kg m^{-1} sec^{-1}	k, k-cal m^{-1} sec^{-1}(°K)$^{-1}$
0	0	272.59	-0.56	-15.56	1.01800 + 3	1.005	1.301 + 0	1.062	331.0	1.713 - 5	5.759 - 6
250	250	271.70	-1.45	-14.83	9.665 + 2	1.003	1.265	1.058	330.4	1.709	5.741
500	500	270.80	-2.35	-14.10	9.360	1.001	1.230	1.054	329.9	1.704	5.724
750	750	269.90	-3.25	-13.38	9.262	1.000	1.196	1.050	329.3	1.700	5.707
1000	1000	269.00	-4.15	-12.65	8.974	0.998	1.162	1.045	328.8	1.695	5.690
1250	1250	268.11	-5.04	-11.92	8.693	0.997	1.130	1.041	328.2	1.691	5.673
1500	1500	267.21	-5.94	-11.19	8.420	0.996	1.098	1.038	327.7	1.687	5.656
1750	1750	266.32	-6.83	-10.46	8.155	0.994	1.067	1.034	327.2	1.682	5.638
2000	1999	265.43	-7.72	-9.72	7.897	0.993	1.036	1.029	326.6	1.678	5.621
2250	2249	264.54	-8.61	-8.99	7.647	0.992	1.007	1.026	326.1	1.673	5.604
2500	2499	263.64	-9.51	-8.26	7.404 + 2	0.991	9.783 - 1	1.022	325.5	1.669 - 5	5.587 - 6
2750	2749	262.75	-10.40	-7.53	7.167	0.990	9.503	1.019	324.9	1.664	5.570
3000	2999	261.86	-11.29	-6.80	6.938	0.989	9.230	1.015	324.4	1.660	5.553
3250	3248	260.34	-12.81	-6.69	6.715	0.989	8.985	1.014	323.5	1.652	5.523
3500	3498	258.82	-14.33	-6.59	6.498	0.988	8.746	1.013	322.5	1.644	5.494
3750	3748	257.31	-15.84	-6.48	6.287	0.987	8.511	1.012	321.6	1.637	5.465
4000	3997	255.79	-17.36	-6.38	6.081	0.986	8.282	1.011	320.6	1.629	5.435
4250	4247	254.28	-18.87	-6.26	5.881	0.985	8.057	1.010	319.7	1.621	5.406
4500	4497	252.77	-20.38	-6.15	5.686	0.985	7.837	1.009	318.7	1.615	5.377
4750	4746	251.27	-21.88	-6.03	5.497	0.984	7.622	1.007	317.8	1.606	5.347
5000	4996	249.76	-23.39	-5.92	5.313 + 2	0.983	7.411 - 1	1.006	316.8	1.598 - 5	5.318 - 6
5250	5246	248.25	-24.90	-5.80	5.134	0.982	7.205	1.005	315.9	1.590	5.289
5500	5495	246.75	-26.40	-5.69	4.960	0.981	7.003	1.004	314.9	1.582	5.259
5750	5745	245.24	-27.91	-5.57	4.791	0.981	6.806	1.003	313.9	1.574	5.230
6000	5994	243.73	-29.42	-5.45	4.627	0.980	6.614	1.002	313.0	1.567	5.200
6250	6244	242.23	-30.92	-5.33	4.468	0.979	6.425	1.001	312.0	1.559	5.171
6500	6493	240.73	-32.42	-5.21	4.313	0.978	6.241	1.000	311.0	1.551	5.141
6750	6743	239.23	-33.92	-5.09	4.162	0.978	6.061	0.999	310.1	1.543	5.111
7000	6992	237.73	-35.42	-4.97	4.016	0.977	5.885	0.998	309.1	1.535	5.082
7250	7242	236.23	-36.92	-4.85	3.874	0.976	5.714	0.996	308.1	1.527	5.052
7500	7491	234.73	-38.42	-4.73	3.737 + 2	0.976	5.546 - 1	0.995	307.1	1.519 - 5	5.023 - 6
7750	7741	233.22	-39.93	-4.61	3.603	0.975	5.382	0.994	306.1	1.511	4.993
8000	7990	231.72	-41.43	-4.49	3.473	0.974	5.222	0.993	305.2	1.503	4.963
8250	8239	230.23	-42.92	-4.37	3.348	0.974	5.065	0.992	304.2	1.495	4.933
8500	8489	228.73	-44.42	-4.24	3.226	0.973	4.913	0.991	303.2	1.487	4.904
8750	8738	227.23	-45.92	-4.12	3.107	0.972	4.764	0.990	302.2	1.479	4.874
9000	8987	225.74	-47.41	-4.00	2.993	0.972	4.618	0.989	301.2	1.471	4.844
9250	9237	224.24	-48.91	-3.87	2.881	0.971	4.477	0.988	300.2	1.463	4.814
9500	9486	222.74	-50.41	-3.75	2.774	0.971	4.338	0.987	299.2	1.455	4.784
9750	9735	221.24	-51.91	-3.63	2.669	0.970	4.203	0.986	298.2	1.447	4.754
10000	9984	219.75	-53.40	-3.50	2.568 + 2	0.969	4.071 - 1	0.985	297.2	1.439 - 5	4.724 - 6
10250	10233	219.54	-53.61	-2.10	2.471	0.969	3.920	0.978	297.0	1.437	4.720
10500	10483	219.41	-53.74	-0.60	2.377	0.968	3.773	0.971	296.9	1.437	4.71
10750	10732	219.29	-53.86	0.89	2.286	0.969	3.632	0.965	296.9	1.436	4.715
11000	10981	219.16	-53.99	2.39	2.199	0.969	3.496	0.958	296.8	1.435	4.712
11500	11479	218.91	-54.24	2.26	2.035	0.970	3.238	0.960	296.6	1.434	4.707
12000	11977	218.66	-54.49	2.01	1.882	0.970	2.999	0.962	296.4	1.433	4.702
12500	12475	218.41	-54.74	1.76	1.741	0.971	2.778	0.963	296.3	1.431	4.697
13000	12973	218.16	-54.99	1.51	1.611	0.972	2.572	0.965	296.1	1.430	4.692
13500	13471	217.91	-55.24	1.26	1.490	0.972	2.382	0.966	295.9	1.429	4.687
14000	13969	217.67	-55.48	1.02	1.378 + 2	0.972	2.205 - 1	0.968	295.8	1.427 - 5	4.682 - 6
14500	14467	217.42	-55.73	0.77	1.274	0.973	2.042	0.970	295.6	1.426	4.677
15000	14965	217.17	-55.98	0.52	1.178	0.973	1.890	0.970	295.4	1.424	4.672
15500	15462	216.92	-56.23	0.27	1.090	0.973	1.750	0.972	295.3	1.423	4.667
16000	15960	216.67	-56.48	0.02	1.008	0.973	1.620	0.973	295.1	1.422	4.662
16500	16457	216.42	-56.73	-0.23	9.315 + 1	0.973	1.499	0.974	294.9	1.420	4.657
17000	16955	216.17	-56.96	-0.48	8.611	0.973	1.388	0.975	294.7	1.419	4.652
17500	17452	215.92	-57.23	-0.73	7.960	0.973	1.284	0.976	294.6	1.418	4.647
18000	17949	215.68	-57.47	-0.97	7.357	0.973	1.188	0.977	294.4	1.416	4.642
18500	18446	215.43	-57.72	-1.22	6.800	0.972	1.100	0.977	294.2	1.415	4.637
19000	18943	215.18	-57.97	-1.47	6.284 + 1	0.972	1.017 - 1	0.978	294.1	1.414 - 5	4.632 - 6
19500	19440	215.15	-58.00	-1.50	5.807	0.971	9.403 - 2	0.978	294.0	1.413	4.631
20000	19937	215.15	-58.00	-1.50	5.367	0.971	8.690	0.977	294.0	1.413	4.631
20500	20434	215.15	-58.00	-1.93	4.960	0.970	8.030	0.979	294.0	1.413	4.631
21000	20931	215.15	-58.00	-2.43	4.583	0.969	7.421	0.980	294.0	1.413	4.631
21500	21428	215.15	-58.00	-2.93	4.236	0.968	6.859	0.981	294.0	1.413	4.631
22000	21924	215.15	-58.00	-3.42	3.915	0.967	6.338	0.983	294.0	1.413	4.631
22500	22421	215.15	-58.00	-3.92	3.618	0.966	5.858	0.984	294.0	1.413	4.631
23000	22917	215.15	-58.00	-4.42	3.344	0.964	5.414	0.984	294.0	1.413	4.631
23500	23413	215.15	-58.00	-4.91	3.090	0.963	5.004	0.985	294.0	1.413	4.631
24000	23910	215.15	-58.00	-5.41	2.856 + 1	0.961	4.624 - 2	0.985	294.0	1.413 - 5	4.631 - 6
24500	24406	215.15	-58.00	-5.91	2.640	0.959	4.274	0.985	294.0	1.413	4.631
25000	24902	215.15	-58.00	-6.40	2.440	0.957	3.950	0.986	294.0	1.413	4.631
25500	25398	215.15	-58.00	-6.90	2.255	0.955	3.651	0.985	294.0	1.413	4.631
26000	25894	215.15	-58.00	-7.39	2.084	0.953	3.375	0.985	294.0	1.413	4.631
26500	26390	215.15	-58.00	-7.89	1.926	0.950	3.119	0.985	294.0	1.413	4.631
27000	26886	215.15	-58.00	-8.39	1.780	0.947	2.883	0.984	294.0	1.413	4.631
27500	27382	215.46	-57.69	-8.58	1.646	0.944	2.661	0.982	294.3	1.415	4.638
28000	27877	215.85	-57.30	-8.68	1.521	0.941	2.455	0.979	294.5	1.417	4.646
28500	28373	216.25	-56.90	-8.77	1.407	0.938	2.266	0.976	294.8	1.419	4.654

TABLE 5.1.—*Continued*
45° N. January
GEOPOTENTIAL ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, m'	Z, m	T, °K	t, °C	$T-T_{ss}$	P, mb	$\frac{P}{P_{ss}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{ss}}$	C_s, m sec^{-1}	μ, kg m^{-1} sec^{-1}	k, kcal m^{-1} sec^{-1} (°K)$^{-1}$
29000	29133	216.75	-56.40	-8.90	1.274 + 1	0.935	2.048 - 2	0.973	295.1	1.422 - 5	4.664 - 6
29500	29638	217.15	-56.00	-9.00	1.178	0.932	1.889	0.970	295.4	1.424	4.672
30000	30142	217.55	-55.60	-9.10	1.089	0.929	1.743	0.968	295.7	1.427	4.680
30500	30647	217.95	-55.20	-9.20	1.007	0.926	1.609	0.965	296.0	1.429	4.688
31000	31152	218.35	-54.80	-9.30	9.308 + 0	0.923	1.485	0.962	296.2	1.431	4.696
31500	31657	218.75	-54.40	-9.40	8.606	0.920	1.371	0.960	296.5	1.433	4.704
32000	32162	219.15	-54.00	-9.50	7.962	0.917	1.266	0.957	296.8	1.435	4.712
33000	33172	222.25	-50.90	-9.20	6.820	0.912	1.069	0.949	298.9	1.452	4.774
34000	34183	225.35	-47.80	-8.90	5.854	0.906	9.050 - 3	0.942	300.9	1.469	4.836
35000	35194	228.45	-44.70	-8.60	5.036	0.901	7.880	0.935	303.0	1.486	4.898
36000	36205	231.55	-41.60	-8.30	4.341 + 0	0.896	6.831 - 3	0.928	305.0	1.502 - 5	4.960 - 6
37000	37217	234.65	-38.50	-8.00	3.749	0.892	5.966	0.922	307.1	1.519	5.021
38000	38229	237.75	-35.40	-7.70	3.244	0.888	4.754	0.916	309.1	1.535	5.082
39000	39241	240.85	-32.30	-7.40	2.813	0.884	4.068	0.911	311.1	1.552	5.143
40000	40253	243.95	-29.20	-7.10	2.443	0.880	3.489	0.906	313.1	1.568	5.204
41000	41266	247.05	-26.10	-6.80	2.126	0.877	2.997	0.901	315.1	1.584	5.265
42000	42279	250.15	-23.00	-6.50	1.853	0.874	2.580	0.896	317.1	1.600	5.326
43000	43293	253.25	-19.90	-6.20	1.617	0.871	2.225	0.892	319.0	1.616	5.386
44000	44307	256.35	-16.80	-5.90	1.415	0.868	1.922	0.888	321.0	1.632	5.446
45000	45321	259.45	-13.70	-5.60	1.239	0.866	1.664	0.884	322.9	1.647	5.506
46000	46335	262.55	-10.60	-5.30	1.087 + 0	0.863	1.442 - 3	0.881	324.8	1.663 - 5	5.566 - 6
47000	47350	265.65	-7.50	-5.00	9.551 - 1	0.861	1.253	0.877	326.7	1.679	5.626
48000	48365	265.65	-7.50	-5.00	8.399	0.859	1.101	0.875	326.7	1.679	5.626
49000	49381	265.65	-7.50	-5.00	7.385	0.857	9.685 - 4	0.873	326.7	1.679	5.626
50000	50396	265.65	-7.50	-5.00	6.494	0.855	8.516	0.871	326.7	1.679	5.626
51000	51413	265.65	-7.50	-5.00	5.710	0.853	7.488	0.869	326.7	1.679	5.626
52000	52429	265.65	-7.50	-5.00	5.021	0.851	6.585	0.867	326.7	1.679	5.626
53000	53446	263.65	-9.50	-5.00	4.413	0.849	5.831	0.865	325.5	1.669	5.587
54000	54463	261.65	-11.50	-5.00	3.875	0.847	5.159	0.863	324.3	1.659	5.549
55000	55480	259.65	-13.50	-5.00	3.399	0.845	4.560	0.861	323.0	1.648	5.510
56000	56498	257.65	-15.50	-5.00	2.978 - 1	0.843	4.027 - 4	0.859	321.8	1.638 - 5	5.471 - 6
57000	57516	255.65	-17.50	-5.00	2.607	0.841	3.553	0.857	320.5	1.628	5.433
58000	58534	253.65	-19.50	-5.00	2.280	0.838	3.131	0.855	319.3	1.618	5.394
59000	59553	251.65	-21.50	-5.00	1.991	0.836	2.757	0.853	318.0	1.608	5.355
60000	60572	249.65	-23.50	-5.00	1.738	0.834	2.425	0.851	316.7	1.597	5.316
61000	61591	247.65	-25.50	-5.00	1.515	0.832	2.131	0.848	315.5	1.587	5.277
62000	62611	245.65	-27.50	-3.00	1.319	0.830	1.870	0.846	314.2	1.577	5.238
63000	63631	243.65	-29.50	-1.00	1.147	0.829	1.640	0.832	312.9	1.566	5.198
64000	64651	241.65	-31.50	1.00	9.962 - 2	0.829	1.436	0.825	311.6	1.556	5.159
65000	65672	239.55	-33.60	2.90	8.643	0.830	1.257	0.820	310.3	1.545	5.118
66000	66692	237.45	-35.70	4.80	7.490 - 2	0.832	1.099 - 4	0.815	308.9	1.534 - 5	5.076 - 6
67000	67714	235.35	-37.80	6.70	6.482	0.835	9.595 - 5	0.811	307.5	1.523	5.035
68000	68735	233.25	-39.90	8.60	5.603	0.839	8.368	0.808	306.2	1.511	4.993
69000	69757	231.15	-42.00	10.50	4.836	0.844	7.288	0.806	304.8	1.500	4.952
70000	70779	229.05	-44.10	12.40	4.159	0.851	6.340	0.805	303.4	1.489	4.910
71000	71802	226.95	-46.20	14.30	3.589	0.859	5.509	0.805	302.0	1.478	4.868
72000	72825	224.85	-48.30	16.20	3.085	0.868	4.780	0.806	300.6	1.466	4.826
73000	73848	222.75	-50.40	18.10	2.648	0.880	4.142	0.808	299.2	1.455	4.784
74000	74872	220.65	-52.50	20.00	2.270	0.892	3.584	0.811	297.8	1.444	4.742
75000	75896	218.55	-54.60	21.90	1.943	0.907	3.097	0.816	296.4	1.432	4.700
76000	76920	216.45	-56.70	23.80	1.661 - 2	0.924	2.673 - 5	0.822	294.9	1.421 - 5	4.658 - 6
77000	77944	214.35	-58.80	25.70	1.417	0.943	2.303	0.830	293.5	1.409	4.615
78000	78969	212.25	-60.90	27.60	1.207	0.963	1.982	0.840	292.1	1.397	4.573
79000	79994	210.15	-63.00	29.50	1.027	0.989	1.702	0.851	290.6	1.386	4.530
80000	81020	208.04	-65.11	27.39	8.727 - 3	1.015	1.460	0.882	289.2	1.374	4.488
81000	82046	205.92	-67.23	25.27	7.395	1.040	1.251	0.912	287.7	1.362	4.445
82000	83072	203.81	-69.34	23.16	6.259	1.064	1.070	0.942	286.2	1.350	4.403
83000	84098	201.69	-71.46	21.04	5.289	1.086	9.132 - 6	0.972	284.7	1.338	4.360
84000	85125	199.58	-73.57	18.93	4.461	1.107	7.784	1.001	283.3	1.327	4.317
85000	86152	199.57	-73.58	18.92	3.759	1.127	6.560	1.020	283.3	1.327	4.317
86000	87180	199.55	-73.60	18.90	3.168 - 3	1.147	5.528 - 6	1.038	283.3	1.327 - 5	4.317 - 6
87000	88207	199.54	-73.61	18.89	2.670	1.168	4.659	1.057	283.3	1.327	4.317
88000	89235	199.52	-73.63	18.87	2.250	1.189	3.926	1.076	283.3	1.327	4.317
89000	90264	199.40	-73.69	18.82	1.896	1.211	3.308	1.100	283.3	1.327	4.317
90000	91293	199.24	-73.91	18.73	1.598	1.230	2.788	1.137	283.3	1.327	4.317
92000	93351	204.40	-68.75	13.79	1.140	1.263	1.935	1.174	287.2	1.358	4.431
94000	95411	209.31	-63.84	12.60	8.210 - 4	1.294	1.356	1.209	291.1	1.390	4.545
96000	97472	213.47	-59.68	10.71	5.963	1.323	9.596 - 7	1.241	294.9	1.421	4.658
98000	99535	217.64	-55.51	8.93	4.366	1.349	6.850	1.271	298.7	1.451	4.770
100000	101598	221.81	-51.34	4.11	3.222	1.371	4.930	1.317	302.5	1.481	4.882
102000	103663	231.14	-42.01	3.55	2.403 - 4	1.388	3.509 - 7	1.332	309.6	1.540 - 5	5.098 - 6
104000	105730	240.42	-32.73	3.06	1.816	1.405	2.536	1.348	316.6	1.596	5.313
106000	107798	249.68	-23.47	2.75	1.389	1.420	1.858	1.362	323.5	1.652	5.525
108000	109867	258.92	-14.23	2.48	1.074	1.436	1.379	1.377	330.2	1.707	5.734
110000	111937	268.14	-5.01	-7.10	8.393 - 5	1.446	1.036	1.435	336.8	1.761	5.942
112000	114009	284.95	11.80	-9.62	6.646	1.448	7.680 - 8	1.445	347.9	1.852	6.297
114000	116082	301.72	28.57	-12.04	5.329	1.447	5.798	1.453	358.7	1.940	6.645
116000	118156	318.46	45.31	-14.26	4.331	1.445	4.449	1.459	369.1	2.025	6.986

TABLE 5.1.—*Continued*
45° N. January
GEOMETRIC ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, m	H, m	T, °K	t, °C	$T-T_{std}$	P, mb	$\frac{P}{P_{std}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{std}}$	C_s, m sec^{-1}	μ, kg m^{-1} sec^{-1}	k, k-cal m^{-1} sec^{-1} (°K)$^{-1}$
29000	28883	216.64	-56.51	-8.87	1.301 + 1	0.936	2.092 - 2	0.974	295.1	1.422 - 5	4.662 - 6
29500	29384	217.04	-56.11	-8.97	1.203	0.933	1.931	0.971	295.3	1.424	4.670
30000	29859	217.44	-55.71	-9.07	1.113	0.930	1.783	0.969	295.6	1.426	4.678
30500	30334	217.83	-55.32	-9.17	1.030	0.927	1.647	0.966	295.9	1.428	4.686
31000	30850	218.23	-54.92	-9.27	9.529 + 0	0.924	1.521	0.963	296.1	1.430	4.693
31500	31345	218.63	-54.52	-9.37	8.819	0.921	1.405	0.961	296.4	1.432	4.701
32000	31840	219.02	-54.13	-9.47	8.163	0.918	1.298	0.958	296.7	1.435	4.709
33000	32830	221.72	-51.43	-9.25	7.001	0.912	1.100	0.951	298.5	1.449	4.764
34000	33819	224.79	-48.36	-8.95	6.017	0.907	9.326 - 3	0.943	300.6	1.466	4.825
35000	34808	227.86	-45.29	-8.66	5.183	0.902	7.924	0.936	302.6	1.483	4.886
36000	35797	230.92	-42.23	-8.36	4.473 + 0	0.897	6.748 - 3	0.930	304.6	1.499 - 5	4.947 - 6
37000	36786	233.99	-39.16	-8.06	3.868	0.893	5.759	0.924	306.6	1.515	5.008
38000	37774	237.05	-36.10	-7.77	3.351	0.889	4.925	0.918	308.6	1.532	5.068
39000	38762	240.11	-33.04	-7.47	2.909	0.885	4.221	0.912	310.6	1.548	5.129
40000	39750	243.17	-29.98	-7.18	2.530	0.881	3.625	0.907	312.6	1.564	5.189
41000	40737	246.24	-26.91	-6.88	2.204	0.878	3.119	0.902	314.6	1.580	5.249
42000	41724	249.30	-23.85	-6.58	1.924	0.874	2.688	0.898	316.5	1.595	5.309
43000	42711	252.35	-20.80	-6.29	1.682	0 871	2.322	0.893	318.5	1.611	5.369
44000	43698	255.41	-17.74	-5.99	1.473	0.869	2.009	0.889	320.4	1.627	5.428
45000	44684	258.47	-14.68	-5.69	1.292	0.866	1.741	0.886	322.3	1.642	5.487
46000	45669	261.53	-11.62	-5.40	1.135 + 0	0.864	1.512 - 3	0.882	324.2	1.658 - 5	5.546 - 6
47000	46655	264.58	-8.57	-5.10	9.985 - 1	0.862	1.315	0.879	326.1	1.673	5.605
48000	47640	265.65	-7.50	-5.00	8.796	0.860	1.154	0.876	326.7	1.679	5.626
49000	48625	265.65	-7.50	-5.00	7.750	0.858	1.016	0.874	326.7	1.679	5.626
50000	49610	265.65	-7.50	-5.00	6.828	0.856	8.954 - 4	0.872	326.7	1.679	5.626
51000	50594	265.65	-7.50	-5.00	6.016	0.854	7.890	0.870	326.7	1.679	5.626
52000	51578	265.65	-7.50	-5.00	5.301	0.852	6.952	0.868	326.7	1.679	5.626
53000	52562	264.53	-8.62	-5.00	4.673	0.850	6.151	0.866	326.0	1.673	5.604
54000	53545	262.56	-10.59	-5.00	4.111	0.848	5.455	0.864	324.8	1.663	5.566
55000	54528	260.59	-12.56	-5.00	3.616	0.846	4.834	0.862	323.6	1.653	5.528
56000	55511	258.63	-14.52	-5.00	3.177 - 1	0.844	4.280 - 4	0.860	322.4	1.643 - 5	5.490 - 6
57000	56493	256.66	-16.49	-5.00	2.789	0.842	3.786	0.858	321.2	1.633	5.452
58000	57476	254.70	-18.45	-5.00	2.446	0.839	3.346	0.856	319.9	1.623	5.414
59000	58457	252.73	-20.42	-5.00	2.143	0.838	2.954	0.854	318.7	1.613	5.376
60000	59439	250.77	-22.38	-5.00	1.876	0.835	2.606	0.852	317.5	1.603	5.338
61000	60420	248.81	-24.34	-5.00	1.640	0.833	2.297	0.850	316.2	1.593	5.299
62000	61401	246.85	-26.30	-4.20	1.433	0.831	2.022	0.845	315.0	1.583	5.261
63000	62382	244.89	-28.26	-2.24	1.250	0.829	1.779	0.837	313.7	1.573	5.223
64000	63362	242.93	-30.22	-0.28	1.090	0.829	1.563	0.830	312.5	1.562	5.184
65000	64342	240.93	-32.22	1.65	9.491 - 2	0.829	1.372	0.824	311.2	1.552	5.145
66000	65322	238.87	-34.28	3.51	8.255 - 2	0.830	1.204 - 4	0.818	309.8	1.541 - 5	5.104 - 6
67000	66301	236.82	-36.33	5.37	7.172	0.833	1.055	0.814	308.5	1.530	5.064
68000	67280	234.76	-38.39	7.23	6.223	0.836	9.235 - 5	0.810	307.2	1.519	5.023
69000	68259	232.71	-40.44	9.09	5.394	0.840	8.075	0.807	305.8	1.508	4.983
70000	69238	230.65	-42.50	10.95	4.669	0.846	7.052	0.806	304.5	1.498	4.942
71000	70216	228.60	-44.55	12.81	4.037	0.853	6.152	0.805	303.1	1.487	4.901
72000	71194	226.54	-46.61	14.67	3.486	0.861	5.360	0.805	301.7	1.475	4.860
73000	72171	224.49	-48.66	16.52	3.006	0.870	4.664	0.806	300.4	1.464	4.819
74000	73148	222.44	-50.71	18.38	2.589	0.881	4.054	0.808	299.0	1.453	4.778
75000	74125	220.39	-52.76	20.24	2.226	0.894	3.519	0.812	297.6	1.442	4.737
76000	75102	218.34	-54.81	22.10	1.912 - 2	0.909	3.031 - 5	0.817	296.2	1.431 - 5	4.696 - 6
77000	76078	216.29	-56.86	23.95	1.640	0.926	2.642	0.823	294.8	1.420	4.654
78000	77054	214.24	-58.91	25.81	1.405	0.944	2.284	0.831	293.4	1.408	4.613
79000	78030	212.19	-60.96	27.66	1.201	0.966	1.973	0.840	292.0	1.397	4.572
80000	79006	210.14	-63.01	29.49	1.026	0.989	1.701	0.851	290.6	1.386	4.530
81000	79981	208.08	-65.07	27.43	8.749 - 3	1.015	1.465	0.881	289.2	1.374	4.489
82000	80956	206.01	-67.14	25.36	7.450	1.039	1.260	0.911	287.8	1.363	4.447
83000	81930	203.95	-69.20	23.30	6.333	1.062	1.081	0.940	286.3	1.351	4.406
84000	82904	201.89	-71.26	21.24	5.375	1.084	9.272 - 6	0.970	284.9	1.340	4.364
85000	83878	199.84	-73.31	19.19	4.555	1.104	7.938	0.998	283.4	1.328	4.322
86000	84852	197.87	-75.28	18.92	3.856 - 3	1.124	6.728 - 6	1.017	283.3	1.327 - 5	4.317 - 6
87000	85825	197.95	-75.20	18.90	3.264	1.144	5.696	1.035	283.3	1.327	4.317
88000	86798	197.94	-75.21	18.89	2.764	1.164	4.822	1.053	283.3	1.327	4.317
89000	87771	197.93	-75.22	18.88	2.340	1.184	4.083	1.072	283.3	1.327	4.317
90000	88743	197.91	-75.24	18.86	1.981	1.205	3.457	1.091	283.3	1.327	4.317
92000	90687	201.02	-72.13	14.40	1.421	1.241	2.456	1.149	284.6	1.337	4.356
94000	92630	204.01	-69.14	13.35	1.027	1.273	1.728	1.185	288.4	1.368	4.467
96000	94572	207.00	-66.15	12.05	7.486 - 4	1.302	1.228	1.218	292.2	1.398	4.577
98000	96512	209.99	-63.16	10.26	5.501	1.329	8.796 - 7	1.249	295.9	1.428	4.687
100000	98451	216.78	-56.37	8.56	4.074	1.354	6.355	1.278	299.6	1.458	4.795
102000	100389	223.63	-49.52	3.97	3.040 - 4	1.374	4.609 - 7	1.319	303.9	1.493 - 5	4.924 - 6
104000	102326	227.03	-46.12	3.47	2.294	1.390	3.325	1.334	310.8	1.549	5.134
106000	104261	241.04	-31.91	5.96	1.753	1.407	2.433	1.349	317.5	1.604	5.341
108000	106196	250.58	-22.57	2.72	1.354	1.422	1.804	1.364	324.2	1.658	5.545
110000	108129	254.51	-18.64	2.51	1.097	1.437	1.354	1.377	330.6	1.711	5.748
112000	110061	264.05	-9.50	-7.20	8.331 - 5	1.446	1.026	1.435	337.1	1.764	5.953
114000	111991	264.68	-8.73	-9.64	6.646	1.447	7.689 - 8	1.445	347.9	1.851	6.295
116000	113921	261.06	-12.41	-11.95	5.374	1.447	5.861	1.453	356.3	1.936	6.631
118000	115849	257.20	-15.95	-14.13	4.397	1.445	4.537	1.458	368.4	2.019	6.961

TABLE 5.1.—*Continued*
45° N. July
GEOPOTENTIAL ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, m'	Z, m	T, °K	t, °C	$T-T_{std}$	P, mb	$\frac{P}{P_{std}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{std}}$	C_s, m sec^{-1}	μ, kg m^{-1} sec^{-1}	k, k-cal m^{-1} sec^{-1}(°K)$^{-1}$
0	0	296.22	23.07	8.07	1.01350 + 3	1.000	1.192 + 0	0.973	345.0	1.878 − 5	6.204 − 6
250	250	294.95	21.80	8.42	9.896 + 2	1.001	1.163	0.972	344.3	1.872	6.180
500	500	293.68	20.53	8.78	9.569	1.002	1.135	0.972	343.5	1.866	6.157
750	750	292.41	19.26	9.14	9.290	1.003	1.107	0.972	342.8	1.860	6.133
1000	1000	291.14	17.99	9.49	9.022	1.004	1.080	0.971	342.1	1.854	6.109
1250	1250	289.90	16.75	9.88	8.761	1.005	1.053	0.970	341.3	1.798	6.086
1500	1500	288.67	15.52	10.27	8.506	1.006	1.026	0.970	340.6	1.792	6.063
1750	1750	287.43	14.28	10.65	8.257	1.007	1.001	0.970	339.9	1.786	6.039
2000	2001	286.19	13.04	11.04	8.015	1.008	9.756 − 1	0.970	339.1	1.780	6.016
2250	2251	284.59	11.44	11.06	7.779	1.009	9.512	0.970	338.2	1.772	5.986
2500	2501	282.98	9.83	11.08	7.548 + 2	1.011	9.292 − 1	0.971	337.2	1.764 − 5	5.956 − 6
2750	2751	281.38	8.23	11.11	7.323	1.012	9.066	0.972	336.3	1.757	5.925
3000	3001	279.78	6.63	11.13	7.103	1.013	8.845	0.973	335.3	1.749	5.895
3250	3252	278.22	5.07	11.20	6.889	1.014	8.626	0.974	334.4	1.741	5.866
3500	3502	276.66	3.51	11.24	6.680	1.016	8.412	0.974	333.4	1.733	5.836
3750	3752	275.11	1.96	11.33	6.477	1.017	8.202	0.975	332.5	1.726	5.806
4000	4003	273.55	0.40	11.40	6.278	1.019	7.995	0.976	331.6	1.718	5.777
4250	4253	272.02	−1.13	11.50	6.085	1.020	7.793	0.977	330.6	1.710	5.748
4500	4503	270.49	−2.66	11.59	5.896	1.021	7.594	0.978	329.7	1.703	5.718
4750	4754	268.96	−4.19	11.68	5.712	1.023	7.399	0.978	328.8	1.695	5.689
5000	5004	267.43	−5.72	11.78	5.533 + 2	1.024	7.208 − 1	0.979	327.8	1.688 − 5	5.660 − 6
5250	5254	265.89	−7.26	11.87	5.359	1.026	7.021	0.980	326.9	1.680	5.630
5500	5505	264.36	−8.79	11.96	5.189	1.027	6.838	0.981	325.9	1.672	5.601
5750	5755	262.83	−10.32	12.06	5.024	1.029	6.658	0.982	325.0	1.665	5.571
6000	6006	261.30	−11.85	12.15	4.863	1.031	6.483	0.983	324.1	1.657	5.542
6250	6256	259.66	−13.49	12.14	4.706	1.032	6.313	0.984	323.0	1.649	5.510
6500	6507	258.03	−15.12	12.13	4.553	1.034	6.147	0.985	322.0	1.640	5.479
6750	6758	256.39	−16.76	12.12	4.404	1.036	5.984	0.987	321.0	1.632	5.447
7000	7008	254.75	−18.40	12.10	4.259	1.037	5.825	0.988	320.0	1.624	5.415
7250	7258	253.12	−20.03	12.09	4.119	1.039	5.668	0.989	318.9	1.615	5.383
7500	7509	251.48	−21.67	12.08	3.982 + 2	1.041	5.515 − 1	0.991	317.9	1.607 − 5	5.352 − 6
7750	7759	249.85	−23.30	12.07	3.848	1.043	5.366	0.992	316.9	1.598	5.320
8000	8010	248.21	−24.94	12.06	3.718	1.044	5.219	0.994	315.8	1.590	5.288
8250	8261	246.58	−26.57	12.06	3.592	1.046	5.075	0.995	314.8	1.581	5.256
8500	8511	244.95	−28.20	12.05	3.470	1.048	4.934	0.997	313.8	1.573	5.224
8750	8762	243.32	−29.83	12.05	3.350	1.050	4.797	0.998	312.7	1.564	5.192
9000	9013	241.69	−31.46	12.04	3.234	1.052	4.662	1.000	311.7	1.556	5.160
9250	9263	240.06	−33.09	12.04	3.122	1.054	4.530	1.001	310.6	1.547	5.128
9500	9514	238.43	−34.72	12.03	3.012	1.056	4.401	1.003	309.5	1.539	5.096
9750	9765	236.80	−36.35	12.03	2.906	1.058	4.275	1.004	308.5	1.530	5.064
10000	10016	235.17	−37.98	12.02	2.803 + 2	1.060	4.151 − 1	1.006	307.4	1.522 − 5	5.031 − 6
10250	10267	233.54	−39.61	12.02	2.702	1.062	4.031	1.007	306.4	1.513	4.999
10500	10517	231.91	−41.24	12.01	2.605	1.065	3.913	1.009	305.3	1.504	4.967
10750	10768	230.28	−42.87	12.01	2.510	1.066	3.798	1.011	304.2	1.496	4.934
11000	11019	228.65	−44.50	12.00	2.419	1.069	3.685	1.013	303.1	1.487	4.902
11500	11521	225.40	−47.75	8.75	2.243	1.072	3.467	1.031	301.0	1.469	4.837
12000	12023	222.15	−51.00	5.50	2.078	1.075	3.259	1.049	298.8	1.452	4.772
12500	12525	218.90	−54.25	2.25	1.924	1.077	3.061	1.066	296.6	1.434	4.707
13000	13027	215.65	−57.50	−1.00	1.778	1.077	2.872	1.082	294.4	1.416	4.642
13500	13529	215.65	−57.50	−1.00	1.643	1.076	2.654	1.081	294.4	1.416	4.642
14000	14031	215.65	−57.50	−1.00	1.518 + 2	1.076	2.452 − 1	1.081	294.4	1.416 − 5	4.642 − 6
14500	14533	215.65	−57.50	−1.00	1.402	1.076	2.265	1.081	294.4	1.416	4.642
15000	15035	215.65	−57.50	−1.00	1.295	1.076	2.092	1.080	294.4	1.416	4.642
15500	15536	215.65	−57.50	−1.00	1.197	1.075	1.933	1.080	294.4	1.416	4.642
16000	16040	215.65	−57.50	−1.00	1.105	1.074	1.786	1.080	294.4	1.416	4.642
16500	16543	215.65	−57.50	−1.00	1.021	1.074	1.650	1.079	294.4	1.416	4.642
17000	17046	215.65	−57.50	−1.00	9.435 + 1	1.074	1.524	1.079	294.4	1.416	4.642
17500	17548	216.25	−56.90	−0.40	8.718	1.074	1.404	1.075	294.8	1.419	4.654
18000	18051	216.85	−56.30	0.20	8.056	1.073	1.294	1.072	295.2	1.423	4.666
18500	18554	217.45	−55.70	0.80	7.447	1.074	1.193	1.070	295.6	1.426	4.678
19000	19057	218.05	−55.10	1.40	6.885 + 1	1.074	1.100 − 1	1.067	296.0	1.429 − 5	4.690 − 6
19500	19560	218.65	−54.50	2.00	6.367	1.075	1.014	1.065	296.4	1.433	4.702
20000	20063	219.25	−53.90	2.60	5.889	1.076	9.357 − 2	1.064	296.8	1.436	4.714
20500	20566	219.85	−53.30	2.70	5.448	1.077	8.633	1.063	297.2	1.439	4.726
21000	21070	220.45	−52.70	2.80	5.042	1.078	7.967	1.064	297.6	1.442	4.738
21500	21573	221.05	−52.10	2.90	4.666	1.079	7.354	1.065	298.1	1.446	4.750
22000	22076	221.65	−51.50	3.00	4.320	1.080	6.789	1.065	298.5	1.449	4.762
22500	22580	222.25	−50.90	3.10	4.000	1.081	6.269	1.066	298.9	1.452	4.774
23000	23084	222.85	−50.30	3.20	3.704	1.082	5.790	1.067	299.3	1.455	4.786
23500	23587	223.45	−49.70	3.30	3.431	1.083	5.349	1.068	299.7	1.459	4.798
24000	24091	224.05	−49.10	3.40	3.179 + 1	1.085	4.943 − 2	1.068	300.1	1.462 − 5	4.810 − 6
24500	24595	224.65	−48.50	3.50	2.946	1.086	4.568	1.069	300.5	1.465	4.822
25000	25099	225.25	−47.90	3.60	2.731	1.087	4.223	1.070	300.9	1.468	4.834
25500	25603	225.85	−47.30	3.70	2.531	1.089	3.905	1.071	301.3	1.472	4.846
26000	26107	226.45	−46.70	3.80	2.347	1.090	3.611	1.072	301.7	1.475	4.858
26500	26611	227.05	−46.10	3.90	2.177	1.092	3.340	1.073	302.1	1.478	4.870
27000	27115	227.65	−45.50	4.00	2.019	1.093	3.090	1.074	302.5	1.481	4.882
27500	27619	228.70	−44.45	4.55	1.874	1.094	2.856	1.073	303.2	1.487	4.903
28000	28124	229.75	−43.40	5.10	1.739	1.097	2.637	1.072	303.9	1.493	4.924
28500	28628	230.80	−42.35	5.65	1.615	1.098	2.437	1.071	304.6	1.498	4.945

TABLE 5.1. – *Continued*

45° N. July

GEOMETRIC ALTITUDE, METRIC UNITS

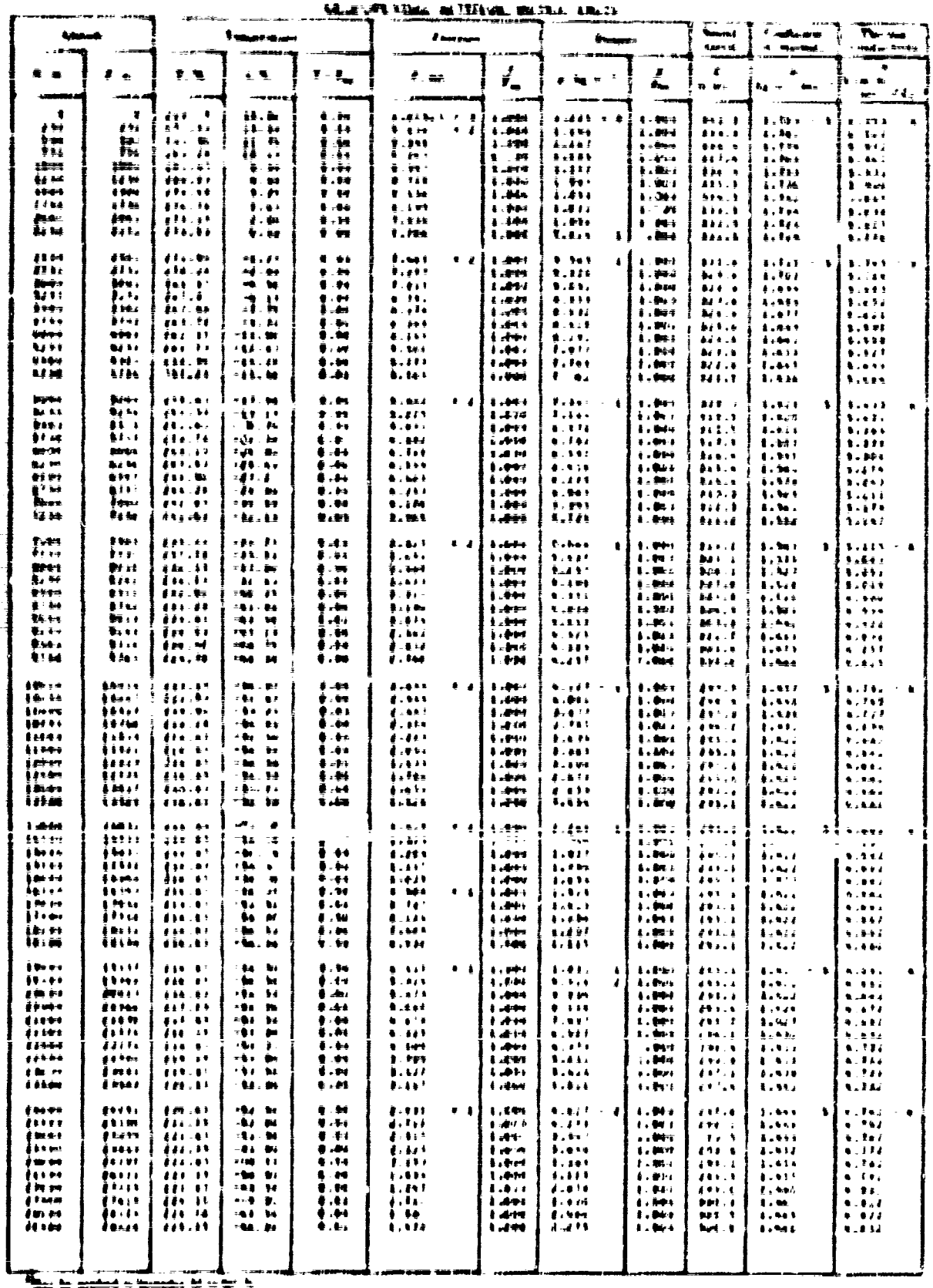
Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, m	H, m'	T, °K	t, °C	$T-T_{sea}$	P, mb	$\frac{P}{P_{sea}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{sea}}$	C_s m sec^{-1}	μ kg m^{-1} sec^{-1}	k k-cal m^{-1} sec^{-1}(°K)$^{-1}$
0	0	296.22	23.07	8.07	1.01350 + 3	1.000	1.192 + 0	0.973	345.0	1.828 – 5	6.204 – 6
250	250	294.95	21.80	8.42	9.846 + 2	1.001	1.163	0.972	344.3	1.822	6.180
500	500	293.68	20.53	8.78	9.565	1.002	1.135	0.971	343.5	1.816	6.157
750	750	292.41	19.26	9.13	9.290	1.003	1.107	0.972	342.8	1.810	6.133
1000	1000	291.14	17.99	9.49	9.022	1.004	1.080	0.971	342.1	1.804	6.109
1250	1250	289.91	16.76	9.88	8.761	1.005	1.053	0.970	341.3	1.798	6.086
1500	1500	288.67	15.52	10.27	8.506	1.006	1.027	0.970	340.6	1.792	6.063
1750	1750	287.43	14.28	10.65	8.258	1.007	1.001	0.970	339.9	1.786	6.040
2000	1999	286.20	13.05	11.04	8.016	1.008	9.757 – 1	0.969	339.1	1.780	6.016
2250	2249	284.59	11.44	11.06	7.779	1.009	9.523	0.970	338.2	1.772	5.986
2500	2499	282.99	9.84	11.08	7.549 + 2	1.011	9.293 – 1	0.971	337.2	1.764 – 5	5.956 – 6
2750	2749	281.39	8.24	11.11	7.324	1.012	9.067	0.972	336.3	1.757	5.926
3000	2999	279.79	6.64	11.13	7.105	1.013	8.846	0.973	335.3	1.749	5.895
3250	3248	278.23	5.08	11.20	6.891	1.015	8.628	0.974	334.4	1.741	5.866
3500	3498	276.68	3.53	11.26	6.682	1.016	8.413	0.974	333.5	1.733	5.836
3750	3748	275.12	1.97	11.33	6.479	1.017	8.203	0.975	332.5	1.726	5.807
4000	3997	273.57	0.42	11.40	6.280	1.019	7.997	0.976	331.6	1.718	5.777
4250	4247	272.04	–1.11	11.49	6.087	1.020	7.795	0.977	330.6	1.711	5.748
4500	4497	270.51	–2.64	11.59	5.899	1.021	7.596	0.978	329.7	1.703	5.719
4750	4746	268.98	–4.17	11.68	5.715	1.023	7.402	0.978	328.8	1.695	5.689
5000	4996	267.45	–5.70	11.77	5.536 + 2	1.024	7.211 – 1	0.979	327.8	1.688 – 5	5.660 – 6
5250	5246	265.92	–7.23	11.87	5.362	1.026	7.024	0.980	326.9	1.680	5.631
5500	5495	264.39	–8.76	11.96	5.192	1.027	6.841	0.981	326.0	1.672	5.601
5750	5745	262.86	–10.29	12.05	5.027	1.029	6.662	0.982	325.0	1.665	5.572
6000	5994	261.33	–11.82	12.15	4.866	1.031	6.487	0.983	324.1	1.657	5.542
6250	6244	259.70	–13.45	12.14	4.709	1.032	6.317	0.984	323.1	1.649	5.511
6500	6493	258.07	–15.08	12.13	4.557	1.034	6.151	0.985	322.0	1.640	5.479
6750	6743	256.44	–16.71	12.12	4.408	1.036	5.989	0.987	321.0	1.632	5.448
7000	6992	254.81	–18.34	12.11	4.264	1.037	5.830	0.988	320.0	1.624	5.416
7250	7242	253.17	–19.98	12.09	4.123	1.039	5.674	0.989	319.0	1.615	5.384
7500	7491	251.54	–21.61	12.08	3.986 + 2	1.041	5.521 – 1	0.991	317.9	1.607 – 5	5.353 – 6
7750	7741	249.91	–23.24	12.07	3.853	1.043	5.371	0.992	316.9	1.599	5.321
8000	7990	248.28	–24.87	12.06	3.724	1.044	5.225	0.994	315.9	1.590	5.289
8250	8239	246.65	–26.50	12.06	3.598	1.046	5.081	0.995	314.8	1.582	5.257
8500	8489	245.03	–28.12	12.05	3.475	1.048	4.941	0.997	313.8	1.573	5.225
8750	8738	243.40	–29.75	12.05	3.356	1.050	4.803	0.998	312.8	1.565	5.194
9000	8987	241.77	–31.38	12.04	3.240	1.052	4.669	0.999	311.7	1.556	5.162
9250	9237	240.15	–33.00	12.04	3.128	1.054	4.537	1.001	310.7	1.548	5.130
9500	9486	238.52	–34.63	12.03	3.018	1.056	4.408	1.003	309.6	1.539	5.098
9750	9735	236.90	–36.25	12.03	2.912	1.058	4.282	1.004	308.6	1.531	5.066
10000	9984	235.27	–37.88	12.02	2.809 + 2	1.060	4.159 – 1	1.006	307.5	1.522 – 5	5.033 – 6
10250	10233	233.65	–39.50	12.02	2.709	1.062	4.039	1.007	306.4	1.514	5.001
10500	10483	232.02	–41.13	12.01	2.612	1.064	3.921	1.009	305.4	1.505	4.969
10750	10732	230.40	–42.75	12.01	2.517	1.067	3.806	1.011	304.3	1.496	4.937
11000	10981	228.77	–44.38	12.00	2.426	1.069	3.693	1.012	303.2	1.487	4.904
11500	11479	225.53	–47.62	8.88	2.250	1.073	3.476	1.030	301.1	1.470	4.840
12000	11977	222.30	–50.85	5.65	2.086	1.075	3.269	1.048	298.9	1.452	4.775
12500	12475	219.06	–54.09	2.41	1.931	1.077	3.071	1.065	296.7	1.435	4.710
13000	12973	215.82	–57.33	–0.83	1.786	1.077	2.882	1.081	294.5	1.417	4.645
13500	13471	215.65	–57.50	–1.00	1.650	1.076	2.666	1.081	294.4	1.416	4.642
14000	13969	215.65	–57.50	–1.00	1.525 + 2	1.076	2.464 – 1	1.081	294.4	1.416 – 5	4.642 – 6
14500	14467	215.65	–57.50	–1.00	1.409	1.076	2.277	1.081	294.4	1.416	4.642
15000	14965	215.65	–57.50	–1.00	1.303	1.076	2.104	1.080	294.4	1.416	4.642
15500	15462	215.65	–57.50	–1.00	1.204	1.075	1.945	1.080	294.4	1.416	4.642
16000	15960	215.65	–57.50	–1.00	1.113	1.075	1.797	1.079	294.4	1.416	4.642
16500	16457	215.65	–57.50	–1.00	1.028	1.074	1.661	1.079	294.4	1.416	4.642
17000	16955	215.65	–57.50	–1.00	9.503 + 1	1.074	1.535	1.079	294.4	1.416	4.642
17500	17452	216.19	–56.96	–0.46	8.784	1.074	1.415	1.076	294.8	1.419	4.652
18000	17949	216.79	–56.36	0.14	8.121	1.074	1.305	1.073	295.2	1.422	4.665
18500	18446	217.39	–55.76	0.74	7.510	1.074	1.204	1.070	295.6	1.426	4.677
19000	18943	217.98	–55.17	1.33	6.946 + 1	1.074	1.110 – 1	1.067	296.0	1.429 – 5	4.689 – 6
19500	19440	218.58	–54.57	1.93	6.427	1.075	1.024	1.065	296.4	1.432	4.700
20000	19937	219.17	–53.98	2.52	5.947	1.076	9.453 – 2	1.063	296.8	1.435	4.712
20500	20434	219.77	–53.38	2.69	5.504	1.077	8.725	1.063	297.2	1.439	4.724
21000	20931	220.37	–52.78	2.79	5.096	1.078	8.056	1.064	297.6	1.442	4.736
21500	21428	220.96	–52.19	2.88	4.719	1.079	7.440	1.065	298.0	1.445	4.748
22000	21924	221.56	–51.59	2.98	4.370	1.080	6.872	1.065	298.4	1.448	4.760
22500	22421	222.15	–51.00	3.08	4.049	1.081	6.349	1.066	298.8	1.452	4.772
23000	22917	222.75	–50.40	3.18	3.752	1.082	5.867	1.067	299.2	1.455	4.784
23500	23413	223.35	–49.80	3.28	3.477	1.083	5.423	1.067	299.6	1.458	4.796
24000	23910	223.94	–49.21	3.38	3.223 + 1	1.084	5.014 – 2	1.068	300.0	1.461 – 5	4.809 – 6
24500	24406	224.54	–48.61	3.48	2.988	1.086	4.636	1.069	300.4	1.465	4.820
25000	24902	225.13	–48.02	3.58	2.771	1.087	4.288	1.070	300.8	1.468	4.832
25500	25398	225.73	–47.42	3.68	2.571	1.088	3.967	1.071	301.2	1.471	4.844
26000	25894	226.32	–46.83	3.78	2.385	1.090	3.671	1.072	301.6	1.474	4.856
26500	26390	226.92	–46.23	3.88	2.213	1.091	3.398	1.073	302.0	1.477	4.867
27000	26886	227.51	–45.64	3.98	2.054	1.093	3.145	1.074	302.4	1.481	4.879
27500	27382	228.45	–44.70	4.42	1.907	1.094	2.908	1.073	303.0	1.486	4.898
28000	27877	229.49	–43.66	4.96	1.771	1.096	2.689	1.072	303.7	1.491	4.919
28500	28373	230.53	–42.62	5.51	1.645	1.098	2.487	1.071	304.4	1.497	4.939

TABLE 5.1.—*Continued*
45° N, July
GEOPOTENTIAL ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, m	Z, m	T, °K	t, °C	$T-T_{std}$	P, mb	$\frac{P}{P_{std}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{std}}$	C_s m sec^{-1}	μ kg m^{-1} sec^{-1}	k k-cal m^{-1} sec^{-1}(°K)$^{-1}$
29000	29133	231.85	−41.30	6.20	1.500 + 1	1.100	2.254 − 2	1.071	305.2	1.504 − 5	4.966 − 6
29500	29638	232.90	−40.25	6.75	1.394	1.102	2.084	1.071	305.9	1.510	4.986
30000	30142	233.95	−39.20	7.30	1.295	1.105	1.929	1.071	306.6	1.515	5.007
30500	30647	235.00	−38.15	7.85	1.204	1.108	1.785	1.071	307.3	1.521	5.028
31000	31152	236.05	−37.10	8.40	1.120	1.111	1.653	1.071	308.0	1.526	5.049
31500	31657	237.10	−36.05	8.95	1.042	1.114	1.531	1.071	308.7	1.532	5.069
32000	32162	238.15	−35.00	9.50	9.697 + 0	1.117	1.418	1.071	309.4	1.537	5.090
33000	33172	240.65	−32.50	9.20	8.407	1.124	1.217	1.081	311.0	1.550	5.139
34000	34183	243.15	−30.00	8.90	7.300	1.130	1.046	1.088	312.6	1.564	5.189
35000	35194	245.65	−27.50	8.60	6.348	1.136	9.002 − 3	1.096	314.2	1.577	5.238
36000	36205	248.15	−25.00	8.30	5.527 + 0	1.141	7.760 − 3	1.103	315.8	1.590 − 5	5.287 − 6
37000	37217	250.65	−22.50	8.00	4.820	1.146	6.699	1.110	317.4	1.602	5.335
38000	38229	253.15	−20.00	7.70	4.208	1.152	5.791	1.117	319.0	1.615	5.384
39000	39241	255.65	−17.50	7.40	3.680	1.156	5.014	1.123	320.5	1.628	5.433
40000	40253	258.15	−15.00	7.10	3.221	1.161	4.347	1.129	322.1	1.641	5.481
41000	41266	260.65	−12.50	6.80	2.824	1.165	3.774	1.135	323.6	1.654	5.529
42000	42279	263.15	−10.00	6.50	2.479	1.169	3.281	1.140	325.2	1.666	5.577
43000	43293	265.65	−7.50	6.20	2.178	1.173	2.856	1.145	326.7	1.679	5.626
44000	44307	268.15	−5.00	5.90	1.916	1.176	2.490	1.151	328.3	1.691	5.674
45000	45321	270.65	−2.50	5.60	1.688	1.180	2.173	1.155	329.8	1.704	5.721
46000	46335	273.15	−0.00	5.30	1.489 + 0	1.183	1.899 − 3	1.159	331.3	1.716 − 5	5.769 − 6
47000	47350	275.65	2.50	5.00	1.315	1.185	1.661	1.163	332.8	1.728	5.817
48000	48365	275.65	2.50	5.00	1.161	1.188	1.468	1.167	332.8	1.728	5.817
49000	49381	275.65	2.50	5.00	1.026	1.191	1.297	1.169	332.8	1.728	5.817
50000	50396	275.65	2.50	5.00	9.064 − 1	1.194	1.145	1.172	332.8	1.728	5.817
51000	51413	275.65	2.50	5.00	8.007	1.196	1.012	1.174	332.8	1.728	5.817
52000	52429	275.65	2.50	5.00	7.074	1.199	8.940 − 4	1.177	332.8	1.728	5.817
53000	53446	273.15	−0.00	4.50	6.246	1.202	7.966	1.182	331.3	1.716	5.769
54000	54463	270.65	−2.50	4.00	5.508	1.204	7.090	1.186	329.8	1.704	5.721
55000	55480	268.15	−5.00	3.50	4.852	1.206	6.304	1.190	328.3	1.691	5.674
56000	56498	265.65	−7.50	3.00	4.269 − 1	1.208	5.599 − 4	1.194	326.7	1.679 − 5	5.626 − 6
57000	57516	263.15	−10.00	2.50	3.752	1.210	4.967	1.198	325.2	1.666	5.577
58000	58534	260.65	−12.50	2.00	3.293	1.211	4.401	1.202	323.6	1.654	5.529
59000	59553	258.15	−15.00	1.50	2.887	1.212	3.895	1.205	322.1	1.641	5.481
60000	60572	255.65	−17.50	1.00	2.527	1.213	3.444	1.208	320.5	1.628	5.433
61000	61591	253.15	−20.00	0.50	2.210	1.213	3.041	1.211	319.0	1.615	5.384
62000	62611	250.65	−22.50	2.00	1.929	1.214	2.681	1.205	317.4	1.602	5.335
63000	63631	248.15	−25.00	1.50	1.681	1.216	2.380	1.208	314.5	1.579	5.247
64000	64651	245.65	−31.50	1.00	1.462	1.216	2.107	1.211	311.6	1.556	5.159
65000	65672	243.15	−36.00	0.50	1.267	1.217	1.862	1.214	308.7	1.532	5.070
66000	66692	232.65	−40.50	−0.00	1.096 − 1	1.217	1.641 − 4	1.217	305.8	1.508 − 5	4.981 − 6
67000	67714	228.15	−45.00	−0.50	9.467 − 2	1.217	1.443	1.219	302.8	1.484	4.892
68000	68735	223.65	−49.50	−1.00	8.121	1.216	1.265	1.221	299.8	1.460	4.802
69000	69757	219.15	−54.00	−1.50	6.960	1.215	1.106	1.223	296.8	1.435	4.712
70000	70779	214.65	−58.50	−2.00	5.946	1.214	9.649 − 5	1.225	293.7	1.411	4.621
71000	71802	210.15	−63.00	−2.50	5.062	1.212	8.392	1.226	290.6	1.386	4.530
72000	72825	205.65	−67.50	−3.00	4.295	1.209	7.276	1.227	287.5	1.360	4.439
73000	73848	201.15	−72.00	−3.50	3.631	1.206	6.288	1.227	284.3	1.335	4.347
74000	74872	196.65	−76.50	−4.00	3.058	1.202	5.417	1.226	281.1	1.309	4.255
75000	75896	192.15	−81.00	−4.50	2.565	1.198	4.650	1.225	277.9	1.284	4.163
76000	76920	187.65	−85.50	−5.00	2.143 − 2	1.192	3.978 − 5	1.224	274.6	1.257 − 5	4.070 − 6
77000	77944	183.15	−90.00	−5.50	1.782	1.186	3.390	1.222	271.3	1.231	3.977
78000	78969	178.65	−94.50	−6.00	1.475	1.179	2.877	1.219	267.9	1.204	3.884
79000	79994	174.15	−99.00	−6.50	1.216	1.171	2.432	1.215	264.5	1.178	3.790
80000	81020	169.64	−103.51	−11.01	9.965 − 3	1.160	2.046	1.236	261.1	1.150	3.696
81000	82046	169.13	−104.02	−15.52	8.125	1.143	1.714	1.250	257.6	1.123	3.601
82000	83072	169.11	−104.04	−15.54	6.607	1.123	1.394	1.228	257.6	1.123	3.601
83000	84098	169.10	−104.05	−15.55	5.372	1.103	1.133	1.207	257.6	1.123	3.601
84000	85125	169.09	−104.06	−15.56	4.368	1.084	9.215 − 6	1.185	257.6	1.123	3.601
85000	86152	169.08	−104.07	−15.57	3.552	1.065	7.493	1.165	257.6	1.123	3.601
86000	87180	169.07	−104.08	−15.58	2.888 − 3	1.046	6.093 − 6	1.144	257.6	1.123 − 5	3.601 − 6
87000	88207	169.06	−104.09	−15.59	2.349	1.027	4.954	1.124	257.6	1.123	3.601
88000	89235	169.04	−104.11	−15.61	1.910	1.009	4.028	1.104	257.6	1.123	3.601
89000	90264	169.03	−104.12	−15.62	1.553	0.992	3.276	1.089	257.6	1.123	3.601
90000	91293	169.02	−104.13	−15.63	1.265	0.974	2.618	1.067	260.1	1.143	3.669
92000	93351	169.00	−104.15	−15.65	8.695 − 4	0.941	1.693	1.027	265.0	1.181	3.802
94000	95411	168.99	−104.16	−15.66	5.786	0.912	1.113	0.992	269.8	1.219	3.936
96000	97472	168.97	−104.18	−15.68	3.994	0.886	7.419 − 7	0.959	274.5	1.257	4.068
98000	99535	168.96	−104.19	−15.69	2.791	0.863	5.014	0.931	279.2	1.294	4.200
100000	101598	168.95	−104.20	−15.70	1.974	0.840	3.432	0.917	283.8	1.331	4.331
102000	103663	211.29	−61.86	−16.39	1.425 − 4	0.823	2.263 − 7	0.859	296.9	1.436 − 5	4.716 − 6
104000	105730	226.12	−47.03	−0.24	1.057	0.817	1.545	0.821	309.5	1.538	5.093
106000	107798	244.80	−28.35	−2.13	8.021 − 5	0.820	1.086	0.796	321.6	1.636	5.464
108000	109867	261.35	−11.80	4.91	6.208	0.830	7.828 − 8	0.781	333.2	1.731	5.829
110000	111937	277.74	4.59	2.55	4.887	0.842	5.767	0.799	344.5	1.823	6.186
112000	114009	304.23	31.08	9.66	3.920	0.855	4.202	0.791	361.4	1.962	6.733
114000	116082	330.47	57.34	16.73	3.206	0.871	3.148	0.789	377.6	2.094	7.264
116000	118156	356.02	82.87	23.90	2.665	0.889	2.414	0.792	393.1	2.221	7.781

TABLE 5.1.—*Continued*
45° N. July
GEOMETRIC ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, m	H, m'	T, °K	t, °C	$T-T_{std}$	P, mb	$\frac{P}{P_{std}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{std}}$	C_s m sec^{-1}	μ kg m^{-1} sec^{-1}	k k-cal m^{-1} sec^{-1} (°K)
29000	28868	231.57	−41.58	6.05	1.529 + 1	1.100	2.301 − 2	1.071	305.1	1.502 − 5	4.960 − 6
29500	29364	232.61	−40.54	6.60	1.422	1.102	2.129	1.071	305.7	1.503	4.981
30000	29859	233.65	−39.50	7.14	1.322	1.105	1.971	1.071	306.4	1.514	5.001
30500	30354	234.69	−38.46	7.69	1.230	1.107	1.826	1.071	307.1	1.519	5.022
31000	30850	235.73	−37.42	8.23	1.145	1.110	1.692	1.071	307.8	1.525	5.042
31500	31345	236.77	−36.38	8.78	1.066	1.113	1.568	1.072	308.5	1.530	5.063
32000	31840	237.81	−35.34	9.32	9.922 + 0	1.116	1.454	1.072	309.1	1.536	5.084
33000	32830	240.22	−32.93	9.25	8.613	1.123	1.249	1.080	310.7	1.548	5.131
34000	33819	242.70	−30.45	8.95	7.488	1.129	1.075	1.087	312.3	1.561	5.180
35000	34808	245.17	−27.98	8.69	6.519	1.135	9.263 − 3	1.095	313.9	1.574	5.228
36000	35797	247.64	−25.51	8.36	5.684 + 0	1.140	7.996 − 3	1.102	315.5	1.587 − 5	5.277 − 6
37000	36786	250.11	−23.04	8.06	4.963	1.146	6.912	1.108	317.0	1.600	5.325
38000	37774	252.58	−20.57	7.77	4.339	1.151	5.984	1.115	318.6	1.612	5.373
39000	38762	255.05	−18.10	7.47	3.799	1.155	5.188	1.121	320.2	1.625	5.421
40000	39750	257.52	−15.63	7.17	3.330	1.160	4.505	1.127	321.7	1.638	5.469
41000	40737	259.99	−13.16	6.88	2.923	1.164	3.917	1.133	323.2	1.650	5.517
42000	41724	262.46	−10.69	6.58	2.569	1.168	3.410	1.139	324.8	1.663	5.564
43000	42711	264.93	−8.22	6.29	2.261	1.171	2.973	1.144	326.3	1.675	5.612
44000	43698	267.39	−5.76	5.99	1.992	1.175	2.595	1.149	327.8	1.687	5.659
45000	44684	269.86	−3.29	5.69	1.757	1.178	2.268	1.154	329.3	1.700	5.706
46000	45669	272.32	−0.83	5.40	1.552 + 0	1.182	1.985 − 3	1.158	330.8	1.712 − 5	5.753 − 6
47000	46655	274.79	1.64	5.10	1.372	1.185	1.739	1.163	332.3	1.724	5.800
48000	47640	275.65	2.50	5.00	1.214	1.187	1.535	1.165	332.8	1.728	5.817
49000	48625	275.65	2.50	5.00	1.075	1.190	1.358	1.168	332.8	1.728	5.817
50000	49610	275.65	2.50	5.00	9.513 − 1	1.192	1.202	1.171	332.8	1.728	5.817
51000	50594	275.65	2.50	5.00	8.420	1.195	1.064	1.173	332.8	1.728	5.817
52000	51578	275.65	2.50	5.00	7.453	1.198	9.420 − 4	1.176	332.8	1.728	5.817
53000	52562	274.25	1.10	4.72	6.597	1.201	8.380	1.180	332.0	1.721	5.790
54000	53545	271.79	−1.36	4.23	5.833	1.203	7.477	1.184	330.5	1.709	5.743
55000	54528	269.33	−3.82	3.73	5.152	1.205	6.664	1.188	329.0	1.697	5.696
56000	55511	266.87	−6.28	3.24	4.546 − 1	1.207	5.934 − 4	1.192	327.5	1.685 − 5	5.649 − 6
57000	56493	264.42	−8.73	2.75	4.006	1.209	5.278	1.196	326.0	1.673	5.602
58000	57476	261.96	−11.19	2.26	3.527	1.210	4.690	1.200	324.5	1.660	5.555
59000	58457	259.51	−13.64	1.77	3.101	1.212	4.163	1.203	322.9	1.648	5.507
60000	59439	257.05	−16.10	1.28	2.723	1.213	3.691	1.207	321.4	1.635	5.460
61000	60420	254.60	−18.55	0.79	2.389	1.213	3.269	1.209	319.9	1.623	5.412
62000	61401	252.15	−21.00	1.10	2.093	1.214	2.892	1.208	318.3	1.610	5.364
63000	62382	248.93	−24.22	1.61	1.831	1.214	2.563	1.206	316.3	1.594	5.302
64000	63362	244.52	−28.63	1.32	1.599	1.216	2.278	1.209	313.5	1.571	5.216
65000	64342	240.11	−33.04	0.83	1.392	1.216	2.020	1.213	310.6	1.548	5.129
66000	65322	235.70	−37.45	0.34	1.210 − 1	1.217	1.788 − 4	1.215	307.8	1.526 − 5	5.042 − 6
67000	66301	231.29	−41.86	−0.15	1.048	1.217	1.579	1.218	304.9	1.501	4.955
68000	67280	226.89	−46.26	−0.64	9.058 − 2	1.217	1.391	1.220	302.0	1.477	4.867
69000	68259	222.48	−50.67	−1.13	7.805	1.216	1.222	1.222	299.0	1.453	4.779
70000	69238	218.08	−55.07	−1.62	6.706	1.215	1.071	1.224	296.0	1.429	4.690
71000	70216	213.68	−59.47	−2.11	5.744	1.213	9.365 − 5	1.225	293.0	1.405	4.602
72000	71194	209.28	−63.87	−2.60	4.905	1.211	8.165	1.226	290.0	1.381	4.513
73000	72171	204.88	−68.27	−3.09	4.174	1.209	7.098	1.227	286.9	1.356	4.423
74000	73148	200.48	−72.67	−3.58	3.540	1.205	6.152	1.227	283.8	1.331	4.334
75000	74125	196.09	−77.06	−4.06	2.992	1.202	5.315	1.226	280.7	1.306	4.244
76000	75102	191.69	−81.46	−4.55	2.519 − 2	1.197	4.578 − 5	1.225	277.6	1.281 − 5	4.154 − 6
77000	76078	187.30	−85.85	−5.04	2.112	1.192	3.929	1.224	274.4	1.255	4.063
78000	77054	182.90	−90.25	−5.53	1.764	1.186	3.360	1.222	271.1	1.230	3.972
79000	78030	178.51	−94.64	−6.02	1.467	1.179	2.863	1.219	267.8	1.204	3.881
80000	79006	174.12	−99.03	−6.53	1.214	1.171	2.429	1.215	264.5	1.177	3.789
81000	79981	169.74	−103.43	−10.93	1.000	1.161	2.053	1.235	261.2	1.151	3.698
82000	80956	165.33	−107.82	−15.32	8.200 − 3	1.144	1.728	1.250	257.8	1.124	3.606
83000	81930	165.12	−108.03	−15.53	6.703	1.124	1.414	1.230	257.6	1.123	3.601
84000	82904	165.10	−108.05	−15.55	5.480	1.105	1.156	1.209	257.6	1.123	3.601
85000	83878	165.09	−108.06	−15.56	4.480	1.086	9.450 − 6	1.188	257.6	1.123	3.601
86000	84852	165.08	−108.07	−15.57	3.663 − 3	1.067	7.726 − 6	1.168	257.6	1.123 − 5	3.601 − 6
87000	85825	165.07	−108.08	−15.58	2.995	1.049	6.317	1.148	257.6	1.123	3.601
88000	86798	165.06	−108.09	−15.59	2.449	1.031	5.165	1.128	257.6	1.123	3.601
89000	87771	165.05	−108.10	−15.60	2.002	1.013	4.224	1.109	257.6	1.123	3.601
90000	88743	165.04	−108.11	−15.61	1.637	0.996	3.454	1.090	257.6	1.123	3.601
92000	90687	164.98	−108.17	−16.64	1.101	0.962	2.250	1.053	261.8	1.156	3.715
94000	92630	165.72	−107.43	−16.84	7.516 − 4	0.932	1.481	1.015	266.5	1.193	3.844
96000	94572	166.46	−106.69	−17.49	5.198	0.904	9.895 − 7	0.982	271.2	1.230	3.974
98000	96512	167.19	−105.96	−18.53	3.640	0.880	6.702	0.951	275.7	1.266	4.102
100000	98451	167.91	−105.24	−19.51	2.579	0.857	4.598	0.924	280.2	1.302	4.230
102000	100389	167.62	−105.53	−22.04	1.848 − 4	0.836	3.155 − 7	0.903	280.4	1.351 − 5	4.406 − 6
104000	102324	214.04	−59.11	−15.14	1.355	0.821	2.122	0.852	299.0	1.453	4.778
106000	104261	230.36	−42.80	−8.28	1.018	0.817	1.473	0.817	311.1	1.551	5.142
108000	106196	240.42	−32.73	−1.43	7.816 − 5	0.821	1.051	0.796	322.7	1.646	5.500
110000	108129	262.41	−10.74	5.41	6.110	0.831	7.671 − 8	0.780	333.9	1.737	5.852
112000	110061	278.60	5.45	2.75	4.853	0.842	5.709	0.798	349.0	1.828	6.203
114000	111991	306.11	32.96	9.59	3.924	0.856	4.208	0.791	361.3	1.961	6.731
116000	113921	327.46	54.31	16.45	3.230	0.870	3.183	0.789	376.9	2.089	7.244
118000	115849	339.06	65.91	23.33	2.701	0.887	2.461	0.791	391.9	2.212	7.742



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Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, m	H, m	T, K	t, °C	T - T_s	P, mb	P/P_s	ρ, kg m^-3	ρ/ρ_s	c, m sec^-1	μ, kg m^-1 sec^-1	k
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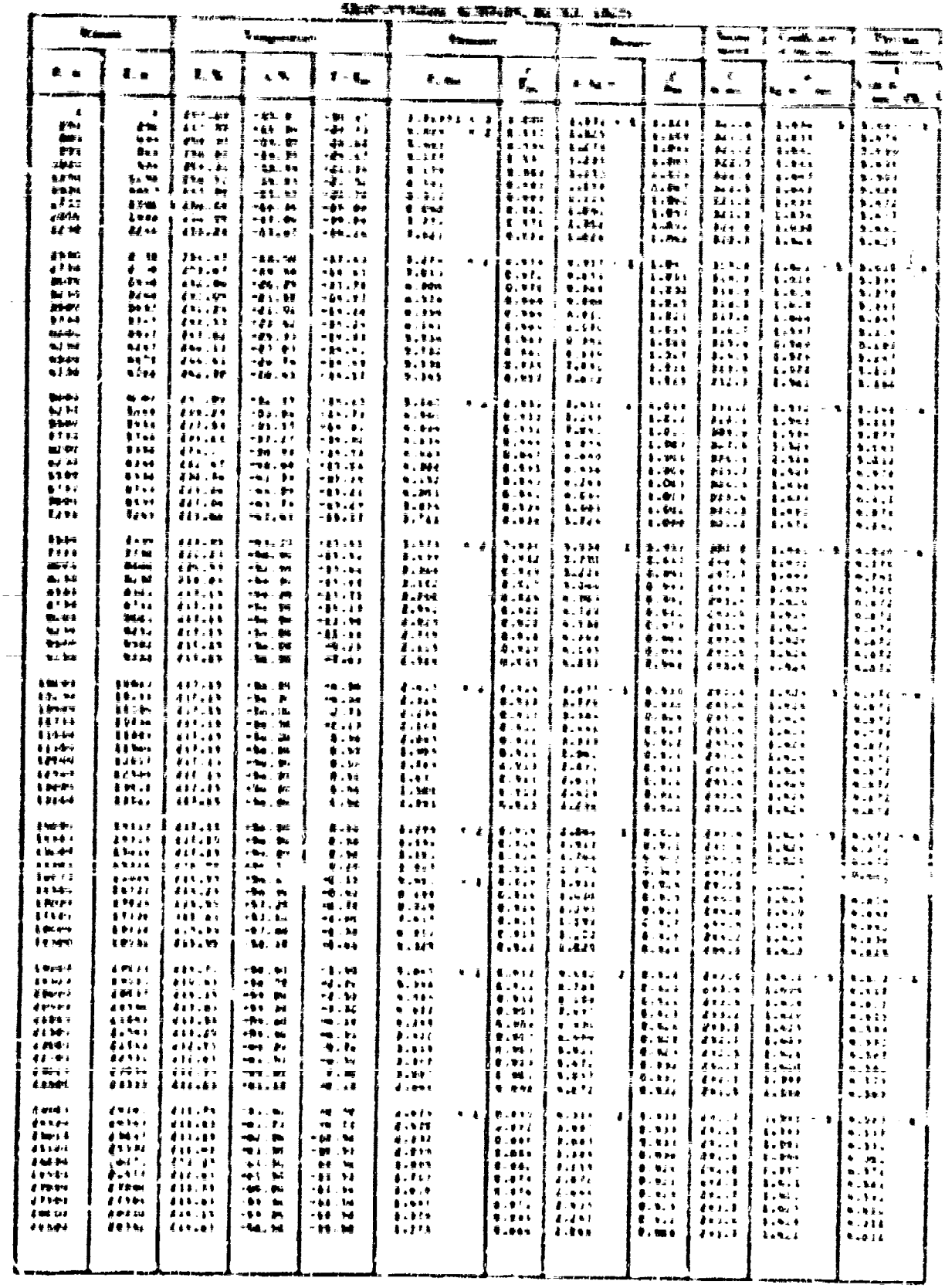

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 5.1 — Continued

60° N, January [illegible]

GEOPOTENTIAL ALTITUDE, METERS [illegible]

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, m	Z, m	T, K	t, °C	T − T_m	P, mb	P/P_m	ρ, kg m⁻³	ρ/ρ_m	C, m/sec	μ, kg m⁻¹ sec⁻¹	k
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

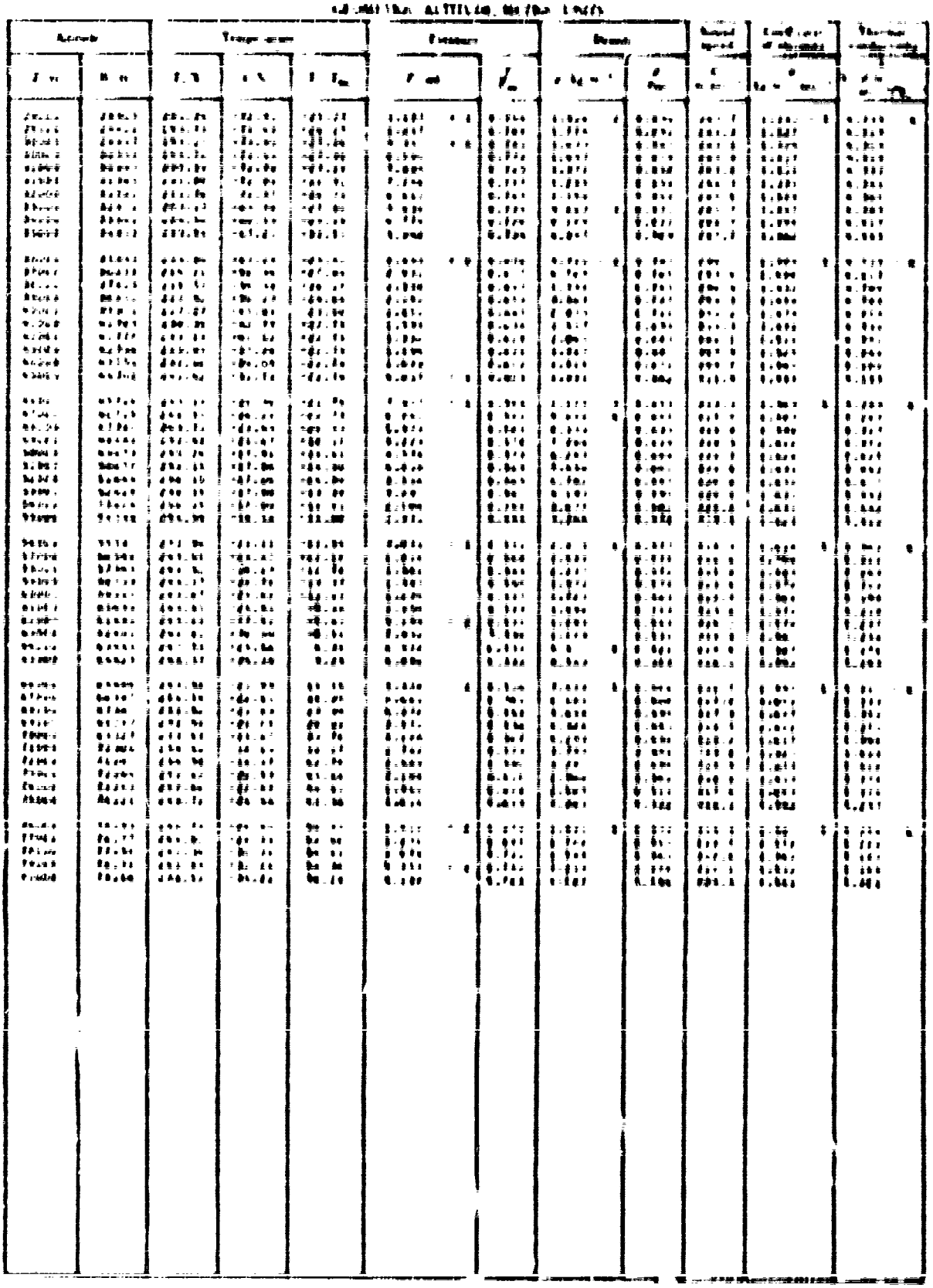

Table 5.1 - Continued

GEOPOTENTIAL ALTITUDE, METERS (1 KFT)

Altitude		Temperature			Pressure		Density		Normal speed	Coefficient of viscosity	Thermal conductivity

Table 5.1 – Continued

GEOMETRIC ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
Z, m	H, m	T, K	t, °C	T/T_{SL}	P, mb	P/P_{SL}	ρ, kg/m^3	ρ/ρ_{SL}	a, m/s	μ, kg/m-s	k, J/m-s-K
0	0	288.150	15.000	1.0000	1.0133 E+3	1.0000	1.2250	1.0000	340.29	1.7894 E-5	2.5348 E-2
500	500	284.900	11.750	0.9893	9.5461 E+2	0.9421	1.1673	0.9529	338.37	1.7579	2.5164
1000	1000	281.651	8.501	0.9786	8.9876	0.8870	1.1117	0.9075	336.43	1.7260	2.4978
1500	1500	278.401	5.251	0.9678	8.4559	0.8345	1.0581	0.8638	334.48	1.7037	2.4790
2000	2000	275.151	2.001	0.9569	7.9501	0.7846	1.0066	0.8217	332.52	1.6812	2.4598
2500	2500	271.901	-1.249	0.9461	7.4691	0.7372	0.9569	0.7812	330.56	1.6585	2.4404
3000	3000	268.651	-4.499	0.9352	7.0121	0.6920	0.9092	0.7423	328.58	1.6356	2.4207
3500	3500	265.401	-7.749	0.9243	6.5780	0.6492	0.8633	0.7048	326.59	1.6124	2.4008
4000	4000	262.151	-10.999	0.9134	6.1660	0.6085	0.8192	0.6689	324.59	1.5890	2.3805
4500	4500	258.901	-14.249	0.9025	5.7752	0.5699	0.7770	0.6343	322.58	1.5653	2.3600
5000	5000	255.651	-17.499	0.8916	5.4048	0.5334	0.7365	0.6012	320.55	1.5414	2.3391
5500	5500	252.401	-20.749	0.8807	5.0541	0.4988	0.6977	0.5694	318.52	1.5172	2.3180
6000	6000	249.151	-23.999	0.8698	4.7224	0.4660	0.6605	0.5389	316.47	1.4928	2.2965
6500	6500	245.901	-27.249	0.8589	4.4090	0.4350	0.6248	0.5098	314.42	1.4681	2.2747
7000	7000	242.651	-30.499	0.8480	4.1132	0.4058	0.5907	0.4820	312.35	1.4431	2.2526
7500	7500	239.401	-33.749	0.8371	3.8343	0.3784	0.5580	0.4556	310.27	1.4178	2.2302
8000	8000	236.151	-36.999	0.8262	3.5717	0.3525	0.5267	0.4304	308.18	1.3923	2.2074
8500	8500	232.901	-40.249	0.8153	3.3247	0.3281	0.4969	0.4066	306.07	1.3665	2.1843
9000	9000	229.651	-43.499	0.8044	3.0928	0.3052	0.4684	0.3839	303.96	1.3404	2.1609
9500	9500	226.401	-46.749	0.7935	2.8755	0.2838	0.4413	0.3625	301.83	1.3140	2.1371
10000	10000	223.151	-49.999	0.7826	2.6723	0.2638	0.4155	0.3422	299.69	1.2873	2.1129
10500	10500	219.901	-53.249	0.7717	2.4826	0.2450	0.3910	0.3231	297.53	1.2603	2.0883
11000	11000	216.651	-56.499	0.7608	2.3060	0.2276	0.3677	0.3051	295.36	1.2330	2.0633
11500	11500	213.401	-59.749	0.7499	2.1420	0.2113	0.3457	0.2882	293.18	1.2053	2.0379
12000	12000	210.151	-62.999	0.7390	1.9900	0.1963	0.3248	0.2723	290.98	1.1772	2.0121
12500	12500	206.901	-66.249	0.7281	1.8495	0.1825	0.3050	0.2574	288.76	1.1488	1.9858
13000	13000	203.651	-69.499	0.7172	1.7199	0.1697	0.2863	0.2435	286.53	1.1200	1.9592
13500	13500	200.401	-72.749	0.7063	1.6008	0.1580	0.2687	0.2306	284.28	1.0908	1.9321
14000	14000	197.151	-75.999	0.6954	1.4917	0.1472	0.2520	0.2187	282.01	1.0612	1.9046
14500	14500	193.901	-79.249	0.6845	1.3922	0.1374	0.2363	0.2077	279.73	1.0312	1.8766
15000	15000	190.651	-82.499	0.6736	1.3019	0.1285	0.2215	0.1977	277.43	1.0008	1.8482
15500	15500	187.401	-85.749	0.6627	1.2204	0.1205	0.2076	0.1887	275.11	0.9700	1.8193
16000	16000	184.151	-88.999	0.6518	1.1474	0.1133	0.1945	0.1806	272.77	0.9388	1.7899
16500	16500	180.901	-92.249	0.6409	1.0824	0.1069	0.1822	0.1735	270.41	0.9072	1.7600
17000	17000	177.651	-95.499	0.6300	1.0250	0.1012	0.1707	0.1673	268.03	0.8752	1.7296
17500	17500	174.401	-98.749	0.6191	0.9747	0.0962	0.1599	0.1621	265.63	0.8428	1.6986
18000	18000	171.151	-101.999	0.6082	0.9312	0.0919	0.1498	0.1578	263.21	0.8100	1.6671
18500	18500	167.901	-105.249	0.5973	0.8940	0.0882	0.1404	0.1543	260.77	0.7768	1.6350
19000	19000	164.651	-108.499	0.5864	0.8627	0.0851	0.1316	0.1516	258.31	0.7432	1.6024
19500	19500	161.401	-111.749	0.5755	0.8369	0.0826	0.1234	0.1496	255.82	0.7092	1.5692
20000	20000	158.151	-114.999	0.5646	0.8163	0.0806	0.1158	0.1483	253.32	0.6747	1.5354
20500	20500	154.901	-118.249	0.5537	0.8005	0.0790	0.1087	0.1477	250.79	0.6398	1.5010
21000	21000	151.651	-121.499	0.5428	0.7894	0.0779	0.1021	0.1477	248.23	0.6044	1.4660
21500	21500	148.401	-124.749	0.5319	0.7826	0.0772	0.0959	0.1483	245.65	0.5686	1.4304
22000	22000	145.151	-127.999	0.5210	0.7797	0.0769	0.0902	0.1496	243.04	0.5323	1.3942
22500	22500	141.901	-131.249	0.5101	0.7803	0.0770	0.0849	0.1515	240.41	0.4956	1.3574
23000	23000	138.651	-134.499	0.4992	0.7839	0.0773	0.0799	0.1541	237.74	0.4584	1.3200
23500	23500	135.401	-137.749	0.4883	0.7900	0.0779	0.0753	0.1573	235.05	0.4208	1.2820
24000	24000	132.151	-140.999	0.4774	0.7981	0.0787	0.0710	0.1611	232.32	0.3826	1.2434
24500	24500	128.901	-144.249	0.4665	0.8080	0.0797	0.0670	0.1655	229.56	0.3440	1.2042
25000	25000	125.651	-147.499	0.4556	0.8194	0.0809	0.0632	0.1705	226.77	0.3049	1.1644
25500	25500	122.401	-150.749	0.4447	0.8321	0.0821	0.0597	0.1760	223.94	0.2653	1.1240
26000	26000	119.151	-153.999	0.4338	0.8459	0.0835	0.0563	0.1820	221.08	0.2252	1.0830
26500	26500	115.901	-157.249	0.4229	0.8606	0.0849	0.0531	0.1885	218.18	0.1846	1.0414
27000	27000	112.651	-160.499	0.4120	0.8761	0.0865	0.0501	0.1954	215.24	0.1435	0.9992
27500	27500	109.401	-163.749	0.4011	0.8923	0.0881	0.0473	0.2028	212.25	0.1019	0.9564
28000	28000	106.151	-166.999	0.3902	0.9091	0.0897	0.0446	0.2106	209.22	0.0598	0.9130
28500	28500	102.901	-170.249	0.3793	0.9264	0.0914	0.0421	0.2187	206.14	0.0172	0.8690
29000	29000	99.651	-173.499	0.3684	0.9441	0.0932	0.0397	0.2272	203.01	-0.0259	0.8244
29500	29500	96.401	-176.749	0.3575	0.9622	0.0950	0.0374	0.2360	199.83	-0.0694	0.7792
30000	30000	93.151	-179.999	0.3466	0.9806	0.0968	0.0353	0.2451	196.60	-0.1134	0.7334
30500	30500	89.901	-183.249	0.3357	0.9992	0.0986	0.0333	0.2545	193.31	-0.1579	0.6870
31000	31000	86.651	-186.499	0.3248	1.0180	0.1005	0.0314	0.2642	189.97	-0.2030	0.6400
31500	31500	83.401	-189.749	0.3139	1.0369	0.1023	0.0296	0.2741	186.57	-0.2487	0.5924
32000	32000	80.151	-192.999	0.3030	1.0559	0.1042	0.0279	0.2843	183.11	-0.2950	0.5442
32500	32500	76.901	-196.249	0.2921	1.0749	0.1061	0.0263	0.2947	179.59	-0.3420	0.4954
33000	33000	73.651	-199.499	0.2812	1.0939	0.1080	0.0248	0.3053	176.01	-0.3897	0.4460
33500	33500	70.401	-202.749	0.2703	1.1128	0.1098	0.0234	0.3161	172.36	-0.4381	0.3960
34000	34000	67.151	-205.999	0.2594	1.1316	0.1117	0.0220	0.3271	168.64	-0.4873	0.3454
34500	34500	63.901	-209.249	0.2485	1.1503	0.1135	0.0207	0.3383	164.85	-0.5373	0.2942
35000	35000	60.651	-212.499	0.2376	1.1688	0.1153	0.0195	0.3497	160.99	-0.5881	0.2424
35500	35500	57.401	-215.749	0.2267	1.1871	0.1171	0.0183	0.3612	157.05	-0.6398	0.1900
36000	36000	54.151	-218.999	0.2158	1.2052	0.1189	0.0172	0.3730	153.04	-0.6924	0.1370
36500	36500	50.901	-222.249	0.2049	1.2230	0.1207	0.0162	0.3849	148.95	-0.7460	0.0834
37000	37000	47.651	-225.499	0.1940	1.2406	0.1224	0.0152	0.3970	144.78	-0.8006	0.0292
37500	37500	44.401	-228.749	0.1831	1.2579	0.1241	0.0143	0.4092	140.52	-0.8563	-0.0256
38000	38000	41.151	-231.999	0.1722	1.2749	0.1258	0.0134	0.4216	136.18	-0.9132	-0.0814
38500	38500	37.901	-235.249	0.1613	1.2916	0.1274	0.0126	0.4341	131.75	-0.9713	-0.1378
39000	39000	34.651	-238.499	0.1504	1.3080	0.1291	0.0118	0.4468	127.23	-1.0307	-0.1948
39500	39500	31.401	-241.749	0.1395	1.3241	0.1307	0.0111	0.4596	122.62	-1.0914	-0.2524
40000	40000	28.151	-244.999	0.1286	1.3398	0.1322	0.0104	0.4726	117.91	-1.1535	-0.3107
40500	40500	24.901	-248.249	0.1177	1.3552	0.1337	0.0097	0.4858	113.09	-1.2171	-0.3697
41000	41000	21.651	-251.499	0.1068	1.3702	0.1352	0.0091	0.4991	108.17	-1.2822	-0.4294
41500	41500	18.401	-254.749	0.0959	1.3848	0.1366	0.0085	0.5126	103.13	-1.3490	-0.4899
42000	42000	15.151	-257.999	0.0850	1.3990	0.1380	0.0080	0.5263	97.98	-1.4176	-0.5512
42500	42500	11.901	-261.249	0.0741	1.4128	0.1394	0.0074	0.5402	92.70	-1.4882	-0.6134
43000	43000	8.651	-264.499	0.0632	1.4262	0.1407	0.0070	0.5543	87.29	-1.5610	-0.6765
43500	43500	5.401	-267.749	0.0523	1.4392	0.1420	0.0065	0.5686	81.74	-1.6362	-0.7406
44000	44000	2.151	-270.999	0.0414	1.4517	0.1432	0.0061	0.5831	76.04	-1.7140	-0.8058
44500	44500	-1.099	-274.249	0.0305	1.4638	0.1444	0.0057	0.5978	70.18	-1.7947	-0.8722
45000	45000	-4.349	-277.499	0.0196	1.4754	0.1456	0.0053	0.6128	64.15	-1.8786	-0.9399

Table 5.1 – Continued

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
H, m	z, m	T, K	t, °C	T/T_{SL}	P, mb	P/P_{SL}	ρ, kg/m³	ρ/ρ_{SL}	a, m/s	μ, kg/(m·s)	k, J/(m·s·K)
0	0	288.15	15.00	1.000	1013.25	1.000	1.2250	1.000	340.29	1.789×10^{-5}	2.534×10^{-2}
500	500	284.90	11.75	0.9881	954.61	0.9421	1.1673	0.9529	338.37	1.783×10^{-5}	2.512×10^{-2}
1000	1000	281.65	8.50	0.9763	898.76	0.8870	1.1117	0.9075	336.43	1.777×10^{-5}	2.489×10^{-2}
1500	1500	278.40	5.25	0.9646	845.60	0.8345	1.0581	0.8639	334.48	1.771×10^{-5}	2.467×10^{-2}
2000	2000	275.15	2.00	0.9528	794.98	0.7846	1.0066	0.8219	332.52	1.764×10^{-5}	2.445×10^{-2}
2500	2500	271.90	−1.25	0.9411	746.77	0.7370	0.9569	0.7812	330.54	1.758×10^{-5}	2.422×10^{-2}
3000	3000	268.65	−4.50	0.9294	700.87	0.6917	0.9093	0.7423	328.55	1.752×10^{-5}	2.400×10^{-2}
3500	3500	265.40	−7.75	0.9176	657.19	0.6486	0.8634	0.7048	326.54	1.745×10^{-5}	2.377×10^{-2}
4000	4000	262.15	−11.00	0.9059	615.66	0.6076	0.8194	0.6689	324.52	1.739×10^{-5}	2.355×10^{-2}
4500	4499	258.90	−14.25	0.8941	576.21	0.5687	0.7770	0.6343	322.48	1.732×10^{-5}	2.332×10^{-2}
5000	4999	255.65	−17.50	0.8824	538.78	0.5317	0.7364	0.6012	320.43	1.726×10^{-5}	2.309×10^{-2}
5500	5499	252.40	−20.75	0.8706	503.31	0.4968	0.6975	0.5694	318.36	1.720×10^{-5}	2.286×10^{-2}
6000	5998	249.15	−24.00	0.8588	469.74	0.4637	0.6601	0.5389	316.27	1.713×10^{-5}	2.263×10^{-2}
6500	6498	245.90	−27.25	0.8471	438.03	0.4324	0.6243	0.5097	314.17	1.707×10^{-5}	2.240×10^{-2}
7000	6997	242.65	−30.50	0.8353	408.12	0.4029	0.5900	0.4817	312.05	1.700×10^{-5}	2.217×10^{-2}
7500	7497	239.40	−33.75	0.8235	379.97	0.3750	0.5572	0.4550	309.91	1.694×10^{-5}	2.194×10^{-2}
8000	7996	236.15	−37.00	0.8118	353.53	0.3488	0.5258	0.4294	307.75	1.687×10^{-5}	2.171×10^{-2}
8500	8495	232.90	−40.25	0.8000	328.75	0.3243	0.4958	0.4050	305.57	1.680×10^{-5}	2.147×10^{-2}
9000	8994	229.65	−43.50	0.7882	305.59	0.3015	0.4671	0.3816	303.37	1.674×10^{-5}	2.124×10^{-2}
9500	9493	226.40	−46.75	0.7765	284.01	0.2803	0.4398	0.3592	301.15	1.667×10^{-5}	2.101×10^{-2}
10000	9992	223.15	−50.00	0.7647	263.97	0.2606	0.4138	0.3378	298.91	1.660×10^{-5}	2.077×10^{-2}
10500	10491	219.90	−53.25	0.7529	245.43	0.2422	0.3891	0.3176	296.64	1.653×10^{-5}	2.054×10^{-2}
11000	10990	216.65	−56.50	0.7412	228.32	0.2253	0.3657	0.2985	294.36	1.646×10^{-5}	2.030×10^{-2}
11500	11489	216.65	−56.50	0.7412	212.24	0.2095	0.3400	0.2776	294.36	1.646×10^{-5}	2.030×10^{-2}
12000	11987	216.65	−56.50	0.7412	197.31	0.1947	0.3161	0.2580	294.36	1.646×10^{-5}	2.030×10^{-2}
12500	12486	216.65	−56.50	0.7412	183.45	0.1811	0.2939	0.2399	294.36	1.646×10^{-5}	2.030×10^{-2}
13000	12985	216.65	−56.50	0.7412	170.57	0.1683	0.2732	0.2230	294.36	1.646×10^{-5}	2.030×10^{-2}
13500	13483	216.65	−56.50	0.7412	158.57	0.1565	0.2540	0.2073	294.36	1.646×10^{-5}	2.030×10^{-2}
14000	13982	216.65	−56.50	0.7412	147.43	0.1455	0.2361	0.1927	294.36	1.646×10^{-5}	2.030×10^{-2}
14500	14480	216.65	−56.50	0.7412	137.03	0.1352	0.2195	0.1792	294.36	1.646×10^{-5}	2.030×10^{-2}
15000	14979	216.65	−56.50	0.7412	127.37	0.1257	0.2040	0.1665	294.36	1.646×10^{-5}	2.030×10^{-2}
15500	15477	216.65	−56.50	0.7412	118.39	0.1168	0.1896	0.1548	294.36	1.646×10^{-5}	2.030×10^{-2}
16000	15975	216.65	−56.50	0.7412	110.06	0.1086	0.1762	0.1439	294.36	1.646×10^{-5}	2.030×10^{-2}
16500	16474	216.65	−56.50	0.7412	102.32	0.1010	0.1638	0.1337	294.36	1.646×10^{-5}	2.030×10^{-2}
17000	16972	216.65	−56.50	0.7412	95.14	0.0939	0.1523	0.1243	294.36	1.646×10^{-5}	2.030×10^{-2}
17500	17470	216.65	−56.50	0.7412	88.48	0.0873	0.1416	0.1156	294.36	1.646×10^{-5}	2.030×10^{-2}
18000	17968	216.65	−56.50	0.7412	82.30	0.0812	0.1317	0.1075	294.36	1.646×10^{-5}	2.030×10^{-2}
18500	18466	216.65	−56.50	0.7412	76.56	0.0756	0.1225	0.1000	294.36	1.646×10^{-5}	2.030×10^{-2}
19000	18964	216.65	−56.50	0.7412	71.22	0.0703	0.1140	0.0931	294.36	1.646×10^{-5}	2.030×10^{-2}
19500	19462	216.65	−56.50	0.7412	66.25	0.0654	0.1060	0.0866	294.36	1.646×10^{-5}	2.030×10^{-2}
20000	19960	216.65	−56.50	0.7412	61.63	0.0608	0.0987	0.0805	294.36	1.646×10^{-5}	2.030×10^{-2}
20500	20458	216.65	−56.50	0.7412	57.33	0.0566	0.0918	0.0749	294.36	1.646×10^{-5}	2.030×10^{-2}
21000	20955	216.65	−56.50	0.7412	53.33	0.0526	0.0854	0.0697	294.36	1.646×10^{-5}	2.030×10^{-2}
21500	21453	216.65	−56.50	0.7412	49.61	0.0490	0.0794	0.0648	294.36	1.646×10^{-5}	2.030×10^{-2}
22000	21951	216.65	−56.50	0.7412	46.15	0.0455	0.0739	0.0603	294.36	1.646×10^{-5}	2.030×10^{-2}
22500	22448	216.65	−56.50	0.7412	42.93	0.0424	0.0687	0.0561	294.36	1.646×10^{-5}	2.030×10^{-2}
23000	22946	216.65	−56.50	0.7412	39.94	0.0394	0.0639	0.0522	294.36	1.646×10^{-5}	2.030×10^{-2}
23500	23443	216.65	−56.50	0.7412	37.16	0.0367	0.0595	0.0485	294.36	1.646×10^{-5}	2.030×10^{-2}
24000	23941	216.65	−56.50	0.7412	34.57	0.0341	0.0553	0.0452	294.36	1.646×10^{-5}	2.030×10^{-2}
24500	24438	216.65	−56.50	0.7412	32.17	0.0318	0.0515	0.0420	294.36	1.646×10^{-5}	2.030×10^{-2}
25000	24935	216.65	−56.50	0.7412	29.94	0.0295	0.0479	0.0391	294.36	1.646×10^{-5}	2.030×10^{-2}
25500	25432	216.65	−56.50	0.7412	27.87	0.0275	0.0446	0.0364	294.36	1.646×10^{-5}	2.030×10^{-2}
26000	25929	216.65	−56.50	0.7412	25.94	0.0256	0.0415	0.0339	294.36	1.646×10^{-5}	2.030×10^{-2}
26500	26426	216.65	−56.50	0.7412	24.14	0.0238	0.0387	0.0315	294.36	1.646×10^{-5}	2.030×10^{-2}
27000	26923	216.65	−56.50	0.7412	22.47	0.0222	0.0360	0.0294	294.36	1.646×10^{-5}	2.030×10^{-2}
27500	27420	216.65	−56.50	0.7412	20.92	0.0206	0.0335	0.0274	294.36	1.646×10^{-5}	2.030×10^{-2}
28000	27917	216.65	−56.50	0.7412	19.47	0.0192	0.0312	0.0255	294.36	1.646×10^{-5}	2.030×10^{-2}
28500	28414	216.65	−56.50	0.7412	18.13	0.0179	0.0290	0.0237	294.36	1.646×10^{-5}	2.030×10^{-2}
29000	28910	216.65	−56.50	0.7412	16.88	0.0167	0.0270	0.0220	294.36	1.646×10^{-5}	2.030×10^{-2}
29500	29407	216.65	−56.50	0.7412	15.72	0.0155	0.0251	0.0205	294.36	1.646×10^{-5}	2.030×10^{-2}
30000	29904	216.65	−56.50	0.7412	14.63	0.0144	0.0234	0.0191	294.36	1.646×10^{-5}	2.030×10^{-2}

GEOMETRIC ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, m	H, m	T, K	t, °C	[illegible]	P, mb	P/P_0	ρ, [illegible]	ρ/ρ_0	C_s, [illegible]	μ, [illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE A.1.—Continued

GEOPOTENTIAL ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
H, m	Z, m	T, K	t, °C	T/T_{SL}	P, mb	P/P_{SL}	ρ, kg m^{-3}	ρ/ρ_{SL}	a, m s^{-1}	μ, kg m^{-1} s^{-1}	k, J m^{-1} s^{-1} K^{-1}
0	0	288.150	15.000	1.0000	1.0132E+3	1.0000	1.2250	1.0000	340.29	1.7894 - 5	0.2534 - 4
500	500	284.900	11.750	0.9930	9.5461E+2	0.9421	1.1673	0.9529	338.37	1.7579	0.2491
1000	1000	281.650	8.500	0.9861	8.9876E+2	0.8870	1.1117	0.9075	336.43	1.7260	0.2447
1500	1500	278.400	5.250	0.9792	8.4559E+2	0.8345	1.0581	0.8638	334.48	1.6938	0.2402
2000	2000	275.150	2.000	0.9723	7.9501E+2	0.7846	1.0066	0.8217	332.52	1.6612	0.2357
2500	2500	271.900	-1.250	0.9654	7.4691E+2	0.7372	0.9569	0.7812	330.55	1.6282	0.2311
3000	3000	268.650	-4.500	0.9585	7.0121E+2	0.6920	0.9092	0.7423	328.57	1.5949	0.2265
3500	3500	265.400	-7.750	0.9516	6.5780E+2	0.6492	0.8633	0.7048	326.58	1.5612	0.2218
4000	4000	262.150	-11.000	0.9447	6.1660E+2	0.6085	0.8191	0.6689	324.57	1.5272	0.2171
4500	4500	258.900	-14.250	0.9378	5.7752E+2	0.5700	0.7768	0.6343	322.56	1.4928	0.2123
5000	5000	255.650	-17.500	0.9309	5.4048E+2	0.5334	0.7361	0.6010	320.53	1.4581	0.2075
5500	5500	252.400	-20.750	0.9240	5.0539E+2	0.4988	0.6971	0.5691	318.49	1.4230	0.2026
6000	6000	249.150	-24.000	0.9171	4.7217E+2	0.4660	0.6597	0.5385	316.44	1.3875	0.1977
6500	6500	245.900	-27.250	0.9102	4.4075E+2	0.4350	0.6238	0.5092	314.38	1.3517	0.1927
7000	7000	242.650	-30.500	0.9033	4.1105E+2	0.4057	0.5895	0.4812	312.30	1.3155	0.1877
7500	7500	239.400	-33.750	0.8964	3.8300E+2	0.3781	0.5567	0.4546	310.21	1.2789	0.1826
8000	8000	236.150	-37.000	0.8895	3.5653E+2	0.3519	0.5252	0.4292	308.11	1.2419	0.1775
8500	8500	232.900	-40.250	0.8826	3.3157E+2	0.3272	0.4952	0.4050	305.99	1.2045	0.1723
9000	9000	229.650	-43.500	0.8757	3.0807E+2	0.3040	0.4665	0.3819	303.86	1.1667	0.1671
9500	9500	226.400	-46.750	0.8688	2.8597E+2	0.2822	0.4391	0.3599	301.71	1.1285	0.1618
10000	9999	223.150	-50.000	0.8619	2.6521E+2	0.2617	0.4130	0.3389	299.55	1.0898	0.1565
10500	10499	219.900	-53.250	0.8550	2.4573E+2	0.2425	0.3881	0.3189	297.37	1.0508	0.1511
11000	10998	216.650	-56.500	0.8481	2.2746E+2	0.2245	0.3643	0.2998	295.18	1.0113	0.1457
11500	11497	216.650	-56.500	0.8481	2.1065E+2	0.2079	0.3374	0.2776	295.18	0.9370	0.1350
12000	11996	216.650	-56.500	0.8481	1.9501E+2	0.1925	0.3124	0.2571	295.18	0.8676	0.1250
12500	12494	216.650	-56.500	0.8481	1.8052E+2	0.1782	0.2893	0.2381	295.18	0.8033	0.1158
13000	12993	216.650	-56.500	0.8481	1.6715E+2	0.1650	0.2679	0.2205	295.18	0.7439	0.1072
13500	13491	216.650	-56.500	0.8481	1.5479E+2	0.1528	0.2480	0.2042	295.18	0.6889	0.0993
14000	13990	216.650	-56.500	0.8481	1.4335E+2	0.1415	0.2297	0.1891	295.18	0.6381	0.0919
14500	14488	216.650	-56.500	0.8481	1.3277E+2	0.1311	0.2127	0.1751	295.18	0.5910	0.0852
15000	14986	216.650	-56.500	0.8481	1.2298E+2	0.1214	0.1970	0.1622	295.18	0.5474	0.0789
15500	15485	216.650	-56.500	0.8481	1.1393E+2	0.1125	0.1825	0.1503	295.18	0.5071	0.0731
16000	15983	216.650	-56.500	0.8481	1.0555E+2	0.1042	0.1691	0.1392	295.18	0.4698	0.0677
16500	16481	216.650	-56.500	0.8481	9.7780E+1	0.0965	0.1566	0.1290	295.18	0.4352	0.0627
17000	16979	216.650	-56.500	0.8481	9.0570E+1	0.0894	0.1451	0.1195	295.18	0.4032	0.0581
17500	17477	216.650	-56.500	0.8481	8.3890E+1	0.0828	0.1344	0.1107	295.18	0.3735	0.0538
18000	17975	216.650	-56.500	0.8481	7.7705E+1	0.0767	0.1245	0.1026	295.18	0.3460	0.0499
18500	18473	216.650	-56.500	0.8481	7.1981E+1	0.0710	0.1153	0.0950	295.18	0.3205	0.0462
19000	18971	216.650	-56.500	0.8481	6.6687E+1	0.0658	0.1069	0.0880	295.18	0.2969	0.0428
19500	19469	216.650	-56.500	0.8481	6.1796E+1	0.0610	0.0990	0.0816	295.18	0.2751	0.0396
20000	19967	216.650	-56.500	0.8481	5.7278E+1	0.0565	0.0918	0.0756	295.18	0.2549	0.0367
20500	20465	216.650	-56.500	0.8481	5.3107E+1	0.0524	0.0851	0.0701	295.18	0.2363	0.0341
21000	20963	216.650	-56.500	0.8481	4.9258E+1	0.0486	0.0789	0.0650	295.18	0.2191	0.0316
21500	21460	216.650	-56.500	0.8481	4.5707E+1	0.0451	0.0732	0.0603	295.18	0.2032	0.0293
22000	21958	216.650	-56.500	0.8481	4.2433E+1	0.0419	0.0679	0.0559	295.18	0.1885	0.0272
22500	22456	216.650	-56.500	0.8481	3.9416E+1	0.0389	0.0630	0.0519	295.18	0.1749	0.0252
23000	22953	216.650	-56.500	0.8481	3.6637E+1	0.0362	0.0585	0.0482	295.18	0.1624	0.0234
23500	23451	216.650	-56.500	0.8481	3.4078E+1	0.0336	0.0544	0.0448	295.18	0.1509	0.0218
24000	23949	216.650	-56.500	0.8481	3.1723E+1	0.0313	0.0506	0.0417	295.18	0.1403	0.0202
24500	24446	216.650	-56.500	0.8481	2.9557E+1	0.0292	0.0471	0.0388	295.18	0.1306	0.0188
25000	24944	216.650	-56.500	0.8481	2.7565E+1	0.0272	0.0439	0.0361	295.18	0.1217	0.0176
25500	25441	216.650	-56.500	0.8481	2.5734E+1	0.0254	0.0409	0.0337	295.18	0.1135	0.0164
26000	25939	216.650	-56.500	0.8481	2.4051E+1	0.0237	0.0383	0.0315	295.18	0.1061	0.0153
26500	26436	216.650	-56.500	0.8481	2.2504E+1	0.0222	0.0358	0.0295	295.18	0.0992	0.0143
27000	26933	216.650	-56.500	0.8481	2.1081E+1	0.0208	0.0335	0.0276	295.18	0.0929	0.0134
27500	27430	216.650	-56.500	0.8481	1.9772E+1	0.0195	0.0314	0.0259	295.18	0.0871	0.0126
28000	27927	216.650	-56.500	0.8481	1.8568E+1	0.0183	0.0295	0.0243	295.18	0.0818	0.0118
28500	28424	216.650	-56.500	0.8481	1.7460E+1	0.0172	0.0277	0.0228	295.18	0.0768	0.0111
29000	28921	216.650	-56.500	0.8481	1.6440E+1	0.0162	0.0261	0.0215	295.18	0.0723	0.0104
29500	29418	216.650	-56.500	0.8481	1.5502E+1	0.0153	0.0246	0.0202	295.18	0.0681	0.0098
30000	29915	216.650	-56.500	0.8481	1.4638E+1	0.0144	0.0232	0.0191	295.18	0.0643	0.0093
30500	30412	216.650	-56.500	0.8481	1.3843E+1	0.0137	0.0220	0.0180	295.18	0.0607	0.0087
31000	30909	216.650	-56.500	0.8481	1.3112E+1	0.0129	0.0208	0.0171	295.18	0.0575	0.0083
31500	31406	216.650	-56.500	0.8481	1.2439E+1	0.0123	0.0197	0.0162	295.18	0.0545	0.0078
32000	31903	216.650	-56.500	0.8481	1.1821E+1	0.0117	0.0187	0.0153	295.18	0.0518	0.0074
32500	32400	216.650	-56.500	0.8481	1.1252E+1	0.0111	0.0178	0.0146	295.18	0.0492	0.0071
33000	32897	216.650	-56.500	0.8481	1.0728E+1	0.0106	0.0170	0.0139	295.18	0.0469	0.0067
33500	33394	216.650	-56.500	0.8481	1.0246E+1	0.0101	0.0162	0.0133	295.18	0.0447	0.0064
34000	33891	216.650	-56.500	0.8481	9.7999E+0	0.0097	0.0155	0.0127	295.18	0.0427	0.0061
34500	34388	216.650	-56.500	0.8481	9.3877E+0	0.0093	0.0148	0.0121	295.18	0.0408	0.0059
35000	34885	216.650	-56.500	0.8481	8.9975E+0	0.0089	0.0142	0.0116	295.18	0.0391	0.0056
35500	35382	216.650	-56.500	0.8481	8.6282E+0	0.0085	0.0136	0.0111	295.18	0.0375	0.0054
36000	35879	216.650	-56.500	0.8481	8.2787E+0	0.0082	0.0131	0.0107	295.18	0.0360	0.0051
36500	36376	216.650	-56.500	0.8481	7.9481E+0	0.0078	0.0125	0.0102	295.18	0.0345	0.0049
37000	36873	216.650	-56.500	0.8481	7.6353E+0	0.0075	0.0120	0.0098	295.18	0.0332	0.0047
37500	37370	216.650	-56.500	0.8481	7.3396E+0	0.0072	0.0116	0.0094	295.18	0.0319	0.0045
38000	37867	216.650	-56.500	0.8481	7.0601E+0	0.0070	0.0111	0.0091	295.18	0.0307	0.0043
38500	38364	216.650	-56.500	0.8481	6.7960E+0	0.0067	0.0107	0.0087	295.18	0.0295	0.0042
39000	38861	216.650	-56.500	0.8481	6.5466E+0	0.0065	0.0103	0.0084	295.18	0.0284	0.0040
39500	39358	216.650	-56.500	0.8481	6.3112E+0	0.0062	0.0099	0.0081	295.18	0.0274	0.0038
40000	39855	216.650	-56.500	0.8481	6.0892E+0	0.0060	0.0096	0.0078	295.18	0.0264	0.0037

Table 5.1 – Continued

(GEOMETRIC ALTITUDE, METRIC UNITS)

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
Z, m	H, m	T, K	t, °C	$T - T_{sl}$	P, mb	$\frac{P}{P_{sl}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{sl}}$	a, m s^{-1}	μ, kg s^{-1} m^{-1}	k, cal m^{-1} s^{-1} K^{-1}
0	0	288.15	15.00	0.00	1.0132 × 10^{3}	1.0000	1.2250 × 10^{0}	1.0000	340.3	1.789 × 10^{-5}	0.0058 × 10^{-4}
152	152	287.01	13.86	0.48	9.8654 × 10^{2}	0.9907	1.1929	0.9907	339.4	1.784	0.0054
305	305	285.90	12.75	0.96	9.716	0.9817	1.1841	0.9817	338.4	1.777	0.0050
457	457	284.81	11.66	1.45	9.578	0.9727	1.1752	0.9727	337.5	1.770	0.0047
1000	1000	281.66	8.51	3.01	8.988	0.9407	1.1396	0.9393	334.8	1.753	0.0040
1524	1523	278.41	5.27	4.74	8.456	0.9061	1.0977	0.8962	331.4	1.734	0.0033
1646	1645	277.80	4.65	5.09	8.334	0.8993	1.0845	0.8854	330.7	1.730	0.0031
1768	1767	277.19	4.04	5.44	8.213	0.8925	1.0713	0.8747	330.1	1.726	0.0030
2000	1999	275.94	2.79	6.14	7.969	0.8787	1.0446	0.8530	328.9	1.718	0.0028
2134	2133	275.15	2.00	6.57	7.815	0.8700	1.0276	0.8391	328.2	1.713	0.0026
2256	2255	274.54	1.39	6.93	7.696	0.8633	1.0145	0.8284	327.6	1.709	0.0025
2500	2499	273.29	0.14	7.68	7.454	0.8496	0.9879	0.8067	326.4	1.701	0.0023
2744	2743	272.03	-1.12	8.41	7.220	0.8364	0.9621	0.7857	325.2	1.693	0.0021
2988	2987	270.77	-2.38	9.17	6.991	0.8234	0.9370	0.7652	324.0	1.685	0.0019
3232	3231	269.51	-3.64	9.93	6.768	0.8107	0.9126	0.7452	322.8	1.677	0.0017
3476	3475	268.25	-4.90	10.69	6.552	0.7983	0.8889	0.7258	321.6	1.669	0.0015
3720	3719	266.99	-6.16	11.45	6.342	0.7862	0.8659	0.7069	320.4	1.661	0.0013
3964	3963	265.73	-7.42	12.21	6.137	0.7744	0.8436	0.6885	319.2	1.653	0.0011
4208	4207	264.47	-8.68	12.97	5.939	0.7629	0.8220	0.6707	318.0	1.645	0.0009
4452	4451	263.21	-9.94	13.73	5.746	0.7516	0.8010	0.6534	316.8	1.637	0.0007
4696	4695	261.95	-11.20	14.49	5.559	0.7406	0.7806	0.6366	315.6	1.629	0.0005
4940	4939	260.69	-12.46	15.25	5.378	0.7298	0.7608	0.6203	314.4	1.621	0.0003
5184	5183	259.43	-13.72	16.01	5.203	0.7193	0.7417	0.6045	313.2	1.613	0.0001
5428	5427	258.17	-14.98	16.77	5.033	0.7090	0.7231	0.5892	312.0	1.605	0.0000
5672	5671	256.91	-16.24	17.53	4.868	0.6989	0.7050	0.5744	310.8	1.597	0.0002
5916	5915	255.65	-17.50	18.29	4.709	0.6890	0.6874	0.5601	309.6	1.589	0.0004
6160	6159	254.39	-18.76	19.05	4.554	0.6793	0.6703	0.5463	308.4	1.581	0.0006
6404	6403	253.13	-20.02	19.81	4.405	0.6698	0.6537	0.5329	307.2	1.573	0.0008
6648	6647	251.87	-21.28	20.57	4.260	0.6605	0.6376	0.5200	306.0	1.565	0.0010
6892	6891	250.61	-22.54	21.33	4.120	0.6514	0.6220	0.5075	304.8	1.557	0.0012
7136	7135	249.35	-23.80	22.09	3.984	0.6425	0.6068	0.4954	303.6	1.549	0.0014
7380	7379	248.09	-25.06	22.85	3.853	0.6338	0.5921	0.4837	302.4	1.541	0.0016
7624	7623	246.83	-26.32	23.61	3.726	0.6252	0.5779	0.4723	301.2	1.533	0.0018
7868	7867	245.57	-27.58	24.37	3.603	0.6168	0.5641	0.4613	300.0	1.525	0.0020
8112	8111	244.31	-28.84	25.13	3.484	0.6085	0.5507	0.4506	298.8	1.517	0.0022
8356	8355	243.05	-30.10	25.89	3.369	0.6004	0.5378	0.4402	297.6	1.509	0.0024
8600	8599	241.79	-31.36	26.65	3.258	0.5925	0.5253	0.4301	296.4	1.501	0.0026
8844	8843	240.53	-32.62	27.41	3.151	0.5847	0.5132	0.4203	295.2	1.493	0.0028
9088	9087	239.27	-33.88	28.17	3.048	0.5771	0.5015	0.4107	294.0	1.485	0.0030
9332	9331	238.01	-35.14	28.93	2.948	0.5696	0.4902	0.4014	292.8	1.477	0.0032
9576	9575	236.75	-36.40	29.69	2.852	0.5623	0.4792	0.3924	291.6	1.469	0.0034
9820	9819	235.49	-37.66	30.45	2.760	0.5551	0.4686	0.3836	290.4	1.461	0.0036
10064	10063	234.23	-38.92	31.21	2.671	0.5481	0.4583	0.3751	289.2	1.453	0.0038
10308	10307	232.97	-40.18	31.97	2.585	0.5412	0.4483	0.3668	288.0	1.445	0.0040
10552	10551	231.71	-41.44	32.73	2.503	0.5344	0.4387	0.3588	286.8	1.437	0.0042
10796	10795	230.45	-42.70	33.49	2.424	0.5278	0.4294	0.3510	285.6	1.429	0.0044
11040	11039	229.19	-43.96	34.25	2.348	0.5213	0.4204	0.3435	284.4	1.421	0.0046
11284	11283	227.93	-45.22	35.01	2.275	0.5149	0.4117	0.3362	283.2	1.413	0.0048
11528	11527	226.67	-46.48	35.77	2.205	0.5086	0.4033	0.3291	282.0	1.405	0.0050
11772	11771	225.41	-47.74	36.53	2.138	0.5025	0.3951	0.3223	280.8	1.397	0.0052
12016	12015	224.15	-49.00	37.29	2.073	0.4964	0.3872	0.3157	279.6	1.389	0.0054
12260	12259	222.89	-50.26	38.05	2.010	0.4905	0.3795	0.3093	278.4	1.381	0.0056
12504	12503	221.63	-51.52	38.81	1.950	0.4847	0.3721	0.3031	277.2	1.373	0.0058
12748	12747	220.37	-52.78	39.57	1.892	0.4790	0.3648	0.2971	276.0	1.365	0.0060
12992	12991	219.11	-54.04	40.33	1.836	0.4734	0.3578	0.2913	274.8	1.357	0.0062
13236	13235	217.85	-55.30	41.09	1.782	0.4679	0.3510	0.2857	273.6	1.349	0.0064
13480	13479	216.59	-56.56	41.85	1.730	0.4625	0.3444	0.2803	272.4	1.341	0.0066
13724	13723	215.33	-57.82	42.61	1.679	0.4572	0.3380	0.2750	271.2	1.333	0.0068
13968	13967	214.07	-59.08	43.37	1.630	0.4520	0.3318	0.2699	270.0	1.325	0.0070
14212	14211	212.81	-60.34	44.13	1.582	0.4469	0.3258	0.2649	268.8	1.317	0.0072
14456	14455	211.55	-61.60	44.89	1.536	0.4419	0.3199	0.2601	267.6	1.309	0.0074
14700	14699	210.29	-62.86	45.65	1.491	0.4370	0.3142	0.2554	266.4	1.301	0.0076
14944	14943	209.03	-64.12	46.41	1.447	0.4322	0.3086	0.2508	265.2	1.293	0.0078
15188	15187	207.77	-65.38	47.17	1.405	0.4275	0.3032	0.2463	264.0	1.285	0.0080
15432	15431	206.51	-66.64	47.93	1.363	0.4228	0.2979	0.2419	262.8	1.277	0.0082
15676	15675	205.25	-67.90	48.69	1.323	0.4182	0.2927	0.2376	261.6	1.269	0.0084
15920	15919	203.99	-69.16	49.45	1.284	0.4137	0.2877	0.2334	260.4	1.261	0.0086
16164	16163	202.73	-70.42	50.21	1.246	0.4092	0.2828	0.2293	259.2	1.253	0.0088
16408	16407	201.47	-71.68	50.97	1.209	0.4048	0.2780	0.2253	258.0	1.245	0.0090
16652	16651	200.21	-72.94	51.73	1.173	0.4004	0.2733	0.2214	256.8	1.237	0.0092
16896	16895	198.95	-74.20	52.49	1.138	0.3961	0.2687	0.2176	255.6	1.229	0.0094
17140	17139	197.69	-75.46	53.25	1.104	0.3918	0.2642	0.2139	254.4	1.221	0.0096
17384	17383	196.43	-76.72	54.01	1.070	0.3876	0.2598	0.2103	253.2	1.213	0.0098
17628	17627	195.17	-77.98	54.77	1.038	0.3834	0.2555	0.2068	252.0	1.205	0.0100
17872	17871	193.91	-79.24	55.53	1.006	0.3793	0.2513	0.2034	250.8	1.197	0.0102
18116	18115	192.65	-80.50	56.29	0.975	0.3752	0.2472	0.2001	249.6	1.189	0.0104
18360	18359	191.39	-81.76	57.05	0.945	0.3712	0.2432	0.1968	248.4	1.181	0.0106
18604	18603	190.13	-83.02	57.81	0.916	0.3672	0.2393	0.1937	247.2	1.173	0.0108
18848	18847	188.87	-84.28	58.57	0.887	0.3633	0.2355	0.1906	246.0	1.165	0.0110
19092	19091	187.61	-85.54	59.33	0.859	0.3594	0.2317	0.1876	244.8	1.157	0.0112
19336	19335	186.35	-86.80	60.09	0.832	0.3556	0.2280	0.1846	243.6	1.149	0.0114
19580	19579	185.09	-88.06	60.85	0.806	0.3518	0.2244	0.1817	242.4	1.141	0.0116
19824	19823	183.83	-89.32	61.61	0.780	0.3481	0.2208	0.1788	241.2	1.133	0.0118
20068	20067	182.57	-90.58	62.37	0.755	0.3444	0.2173	0.1760	240.0	1.125	0.0120
20312	20311	181.31	-91.84	63.13	0.731	0.3408	0.2139	0.1732	238.8	1.117	0.0122
20556	20555	180.05	-93.10	63.89	0.707	0.3372	0.2105	0.1705	237.6	1.109	0.0124
20800	20799	178.79	-94.36	64.65	0.684	0.3336	0.2072	0.1678	236.4	1.101	0.0126
21044	21043	177.53	-95.62	65.41	0.661	0.3301	0.2039	0.1652	235.2	1.093	0.0128
21288	21287	176.27	-96.88	66.17	0.639	0.3266	0.2007	0.1626	234.0	1.085	0.0130
21532	21531	175.01	-98.14	66.93	0.618	0.3232	0.1975	0.1600	232.8	1.077	0.0132
21776	21775	173.75	-99.40	67.69	0.597	0.3198	0.1944	0.1575	231.6	1.069	0.0134
22020	22019	172.49	-100.66	68.45	0.577	0.3164	0.1913	0.1550	230.4	1.061	0.0136
22264	22263	171.23	-101.92	69.21	0.557	0.3130	0.1883	0.1525	229.2	1.053	0.0138
22508	22507	169.97	-103.18	69.97	0.538	0.3097	0.1853	0.1501	228.0	1.045	0.0140
22752	22751	168.71	-104.44	70.73	0.519	0.3064	0.1824	0.1477	226.8	1.037	0.0142
22996	22995	167.45	-105.70	71.49	0.501	0.3031	0.1795	0.1453	225.6	1.029	0.0144
23240	23239	166.19	-106.96	72.25	0.483	0.2998	0.1766	0.1430	224.4	1.021	0.0146
23484	23483	164.93	-108.22	73.01	0.466	0.2966	0.1738	0.1407	223.2	1.013	0.0148
23728	23727	163.67	-109.48	73.77	0.449	0.2934	0.1710	0.1384	222.0	1.005	0.0150
23972	23971	162.41	-110.74	74.53	0.433	0.2902	0.1683	0.1362	220.8	0.997	0.0152
24216	24215	161.15	-112.00	75.29	0.417	0.2870	0.1656	0.1340	219.6	0.989	0.0154
24460	24459	159.89	-113.26	76.05	0.402	0.2839	0.1630	0.1318	218.4	0.981	0.0156
24704	24703	158.63	-114.52	76.81	0.387	0.2808	0.1604	0.1297	217.2	0.973	0.0158
24948	24947	157.37	-115.78	77.57	0.372	0.2777	0.1578	0.1276	216.0	0.965	0.0160
25192	25191	156.11	-117.04	78.33	0.358	0.2746	0.1553	0.1256	214.8	0.957	0.0162
25436	25435	154.85	-118.30	79.09	0.344	0.2716	0.1528	0.1236	213.6	0.949	0.0164
25680	25679	153.59	-119.56	79.85	0.330	0.2686	0.1503	0.1216	212.4	0.941	0.0166

TABLE 5.1 (Continued)

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, m	Z, m	T, K	t, °C	T/T$_0$	P, mb	P/P$_0$	ρ, kg m^{-3}	ρ/ρ$_0$	C, m s^{-1}	μ, kg m^{-1} s^{-1}	k, J m^{-1} s^{-1} K^{-1}
0	0.000	288.15	15.00	1.0000	1013.25	1.0000	1.2250	1.0000	340.29	1.7894 E-5	2.5348 E-2
500	500.000	284.90	11.75	0.9755	954.61	0.9421	1.1673	0.9529	338.37	1.7579	2.5164
1000	999.999	281.65	8.50	0.9511	898.76	0.8870	1.1117	0.9075	336.43	1.7260	2.4978
1500	1499.998	278.40	5.25	0.9267	845.60	0.8345	1.0581	0.8638	334.48	1.6938	2.4789
2000	1999.996	275.15	2.00	0.9023	795.01	0.7846	1.0066	0.8217	332.52	1.6612	2.4598
2500	2499.992	271.91	-1.24	0.8779	746.86	0.7372	0.9569	0.7812	330.54	1.6282	2.4404
3000	2999.988	268.66	-4.49	0.8535	701.04	0.6920	0.9092	0.7423	328.55	1.5949	2.4207
3500	3499.982	265.41	-7.74	0.8291	657.45	0.6490	0.8633	0.7048	326.54	1.5612	2.4007
4000	3999.976	262.16	-10.99	0.8047	615.97	0.6080	0.8191	0.6689	324.52	1.5272	2.3804
4500	4499.968	258.91	-14.24	0.7803	576.54	0.5690	0.7767	0.6343	322.48	1.4928	2.3598
5000	4999.959	255.66	-17.49	0.7559	539.07	0.5320	0.7361	0.6012	320.43	1.4580	2.3389
5500	5499.949	252.41	-20.74	0.7315	503.49	0.4969	0.6972	0.5693	318.36	1.4228	2.3176
6000	5999.938	249.17	-23.98	0.7071	469.72	0.4637	0.6600	0.5389	316.28	1.3872	2.2960
6500	6499.926	245.92	-27.23	0.6827	437.71	0.4322	0.6244	0.5099	314.18	1.3512	2.2741
7000	6999.912	242.67	-30.48	0.6583	407.38	0.4024	0.5905	0.4822	312.07	1.3148	2.2518
7500	7499.897	239.42	-33.73	0.6339	378.68	0.3741	0.5581	0.4559	309.93	1.2780	2.2291
8000	7999.881	236.17	-36.98	0.6095	351.56	0.3473	0.5273	0.4309	307.78	1.2408	2.2061
8500	8499.864	232.92	-40.23	0.5851	325.97	0.3219	0.4980	0.4071	305.61	1.2032	2.1827
9000	8999.845	229.67	-43.48	0.5607	301.87	0.2980	0.4702	0.3845	303.42	1.1652	2.1589
9500	9499.825	226.42	-46.73	0.5363	279.20	0.2756	0.4437	0.3631	301.21	1.1268	2.1347
10000	9999.804	223.17	-49.98	0.5119	257.93	0.2546	0.4187	0.3429	298.99	1.0880	2.1102
10500	10499.781	219.92	-53.23	0.4875	238.03	0.2350	0.3950	0.3238	296.75	1.0488	2.0853
11000	10999.757	216.67	-56.48	0.4631	219.45	0.2167	0.3726	0.3059	294.48	1.0092	2.0600
11500	11499.731	216.67	-56.48	0.4388	207.94	0.2053	0.3530	0.2897	294.48	0.9561	2.0600
12000	11999.705	216.67	-56.48	0.4144	196.33	0.1938	0.3333	0.2735	294.48	0.9030	2.0600
12500	12499.678	216.67	-56.48	0.3900	184.72	0.1824	0.3136	0.2573	294.48	0.8499	2.0600
13000	12999.650	216.67	-56.48	0.3656	173.12	0.1709	0.2940	0.2411	294.48	0.7968	2.0600
13500	13499.621	216.67	-56.48	0.3412	161.51	0.1594	0.2743	0.2249	294.48	0.7437	2.0600
14000	13999.591	216.67	-56.48	0.3168	149.90	0.1480	0.2547	0.2088	294.48	0.6906	2.0600
14500	14499.560	216.67	-56.48	0.2924	138.30	0.1365	0.2350	0.1926	294.48	0.6375	2.0600
15000	14999.528	216.67	-56.48	0.2680	126.69	0.1251	0.2154	0.1765	294.48	0.5844	2.0600
15500	15499.495	216.67	-56.48	0.2436	115.08	0.1136	0.1957	0.1604	294.48	0.5313	2.0600
16000	15999.461	216.67	-56.48	0.2192	103.48	0.1022	0.1761	0.1443	294.48	0.4782	2.0600
16500	16499.426	216.67	-56.48	0.1948	91.87	0.0907	0.1564	0.1282	294.48	0.4251	2.0600
17000	16999.390	216.67	-56.48	0.1704	80.26	0.0792	0.1368	0.1121	294.48	0.3720	2.0600
17500	17499.353	216.67	-56.48	0.1460	68.66	0.0678	0.1171	0.0960	294.48	0.3189	2.0600
18000	17999.315	216.67	-56.48	0.1216	57.05	0.0563	0.0975	0.0799	294.48	0.2658	2.0600
18500	18499.276	216.67	-56.48	0.0972	45.44	0.0449	0.0778	0.0638	294.48	0.2127	2.0600
19000	18999.236	216.67	-56.48	0.0728	33.84	0.0334	0.0582	0.0476	294.48	0.1596	2.0600
19500	19499.195	216.67	-56.48	0.0484	22.23	0.0220	0.0385	0.0315	294.48	0.1065	2.0600
20000	19999.153	216.67	-56.48	0.0240	10.62	0.0105	0.0189	0.0154	294.48	0.0534	2.0600

Table 5.1 — Continued

GEOMETRIC ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, m	H, m	T, K	t, °C	[illegible]	P, mb	P/P_0	ρ, kg m⁻³	ρ/ρ_0	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 3.1 – Continued

GEOPOTENTIAL ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
H, m	Z, m	T, K	t, °C	$T - T_{sl}$, K	P, mb	$\frac{P}{P_{sl}}$	ρ, kg m^{-3}	$\frac{\rho}{\rho_{sl}}$	$a = \sqrt{\frac{\gamma RT}{M}}$, m s^{-1}	$\mu = \frac{\beta T^{3/2}}{T + S}$, kg m^{-1} s^{-1}	$k = \frac{\mu C_p}{Pr}$, W m^{-1} K^{-1}
0	0	288.15	15.00	0.00	1.0132 E + 3	1.0000	1.2250 E + 0	1.0000	340.29	1.7894 E - 5	2.5243 E - 2
250	250	286.91	13.76	−1.24	9.7090 E + 2	0.9584	1.1932	0.9742	339.29	1.7760	2.5047
500	500	285.65	12.50	−2.50	9.2546	0.9134	1.1614	0.9482	338.28	1.7625	2.4850
750	750	284.40	11.25	−3.75	8.8129	0.8698	1.1300	0.9225	337.27	1.7490	2.4652
1000	1000	283.15	10.00	−5.00	8.3836	0.8274	1.0992	0.8973	336.26	1.7355	2.4454
1250	1250	281.89	8.74	−6.26	7.9663	0.7862	1.0689	0.8725	335.25	1.7219	2.4255
1500	1499	280.64	7.49	−7.51	7.5607	0.7462	1.0390	0.8481	334.24	1.7083	2.4055
1750	1749	279.38	6.23	−8.77	7.1665	0.7073	1.0097	0.8242	333.22	1.6947	2.3855
2000	1999	278.13	4.98	−10.02	6.7834	0.6695	0.9808	0.8006	332.21	1.6810	2.3654
2250	2249	276.87	3.72	−11.28	6.4113	0.6328	0.9523	0.7774	331.19	1.6673	2.3452
2500	2499	275.61	2.46	−12.54	6.0499	0.5971	0.9243	0.7546	330.17	1.6536	2.3250
2750	2749	274.35	1.20	−13.80	5.6989	0.5625	0.8967	0.7321	329.15	1.6398	2.3047
3000	2999	273.09	−0.06	−15.06	5.3583	0.5289	0.8695	0.7099	328.13	1.6260	2.2843
3250	3249	271.83	−1.32	−16.32	5.0278	0.4963	0.8428	0.6881	327.11	1.6122	2.2639
3500	3499	270.57	−2.58	−17.58	4.7072	0.4646	0.8165	0.6666	326.08	1.5983	2.2434
3750	3749	269.31	−3.84	−18.84	4.3966	0.4339	0.7906	0.6455	325.05	1.5844	2.2228
4000	3999	268.05	−5.10	−20.10	4.0956	0.4042	0.7651	0.6247	324.02	1.5704	2.2022
4250	4249	266.79	−6.36	−21.36	3.8042	0.3754	0.7400	0.6042	322.99	1.5564	2.1815
4500	4499	265.53	−7.62	−22.62	3.5223	0.3475	0.7153	0.5841	321.95	1.5424	2.1607
4750	4749	264.27	−8.88	−23.88	3.2496	0.3206	0.6910	0.5642	320.92	1.5283	2.1398
5000	4999	263.01	−10.14	−25.14	2.9861	0.2947	0.6671	0.5447	319.88	1.5142	2.1189
5250	5249	261.75	−11.40	−26.40	2.7316	0.2696	0.6436	0.5255	318.83	1.5000	2.0979
5500	5499	260.48	−12.67	−27.67	2.4858	0.2454	0.6205	0.5066	317.78	1.4858	2.0768
5750	5749	259.22	−13.93	−28.93	2.2488	0.2220	0.5978	0.4880	316.73	1.4715	2.0556
6000	5999	257.96	−15.19	−30.19	2.0203	0.1995	0.5755	0.4698	315.68	1.4572	2.0344
6250	6249	256.70	−16.45	−31.45	1.8002	0.1777	0.5536	0.4519	314.62	1.4428	2.0131
6500	6499	255.44	−17.71	−32.71	1.5884	0.1568	0.5321	0.4343	313.56	1.4284	1.9917
6750	6749	254.18	−18.97	−33.97	1.3847	0.1367	0.5111	0.4171	312.49	1.4140	1.9702
7000	6999	252.92	−20.23	−35.23	1.1892	0.1174	0.4904	0.4002	311.42	1.3995	1.9487
7250	7249	251.65	−21.50	−36.50	1.0016	0.0989	0.4702	0.3836	310.35	1.3850	1.9271
7500	7499	250.39	−22.76	−37.76	0.8218	0.0811	0.4504	0.3674	309.27	1.3705	1.9054
7750	7749	249.13	−24.02	−39.02	0.6497	0.0641	0.4310	0.3516	308.19	1.3559	1.8836
8000	7999	247.87	−25.28	−40.28	0.4850	0.0479	0.4120	0.3361	307.10	1.3413	1.8618
8250	8249	246.60	−26.55	−41.55	0.3276	0.0323	0.3934	0.3209	306.01	1.3267	1.8399
8500	8499	245.34	−27.81	−42.81	0.1774	0.0175	0.3752	0.3061	304.92	1.3120	1.8179
8750	8749	244.08	−29.07	−44.07	0.0342	0.0034	0.3574	0.2916	303.82	1.2973	1.7958
9000	8999	242.81	−30.34	−45.34	0.0000	0.0000	0.3400	0.2774	302.72	1.2825	1.7737
9250	9249	241.55	−31.60	−46.60	0.0000	0.0000	0.3229	0.2636	301.61	1.2677	1.7515
9500	9499	240.29	−32.86	−47.86	0.0000	0.0000	0.3063	0.2500	300.50	1.2529	1.7292
9750	9749	239.02	−34.13	−49.13	0.0000	0.0000	0.2901	0.2368	299.39	1.2380	1.7069
10000	9999	237.76	−35.39	−50.39	0.0000	0.0000	0.2742	0.2238	298.28	1.2231	1.6845
10250	10249	236.49	−36.66	−51.66	0.0000	0.0000	0.2588	0.2112	297.16	1.2082	1.6620
10500	10499	235.23	−37.92	−52.92	0.0000	0.0000	0.2437	0.1989	296.03	1.1932	1.6395
10750	10749	233.96	−39.19	−54.19	0.0000	0.0000	0.2291	0.1870	294.90	1.1782	1.6169
11000	10999	232.69	−40.46	−55.46	0.0000	0.0000	0.2148	0.1753	293.77	1.1631	1.5943
11250	11249	231.43	−41.72	−56.72	0.0000	0.0000	0.2009	0.1640	292.63	1.1480	1.5716
11500	11499	230.16	−42.99	−57.99	0.0000	0.0000	0.1874	0.1530	291.49	1.1329	1.5488
11750	11749	228.89	−44.26	−59.26	0.0000	0.0000	0.1743	0.1423	290.34	1.1178	1.5260
12000	11999	227.63	−45.52	−60.52	0.0000	0.0000	0.1615	0.1319	289.19	1.1026	1.5032
12250	12249	226.36	−46.79	−61.79	0.0000	0.0000	0.1491	0.1218	288.04	1.0874	1.4803
12500	12499	225.09	−48.06	−63.06	0.0000	0.0000	0.1371	0.1119	286.88	1.0722	1.4573
12750	12749	223.83	−49.32	−64.32	0.0000	0.0000	0.1255	0.1025	285.72	1.0570	1.4343
13000	12999	222.56	−50.59	−65.59	0.0000	0.0000	0.1142	0.0932	284.55	1.0417	1.4113
13250	13249	221.29	−51.86	−66.86	0.0000	0.0000	0.1033	0.0843	283.38	1.0264	1.3882
13500	13499	220.03	−53.12	−68.12	0.0000	0.0000	0.0928	0.0758	282.21	1.0111	1.3650
13750	13749	218.76	−54.39	−69.39	0.0000	0.0000	0.0826	0.0674	281.03	0.9958	1.3418
14000	13999	217.49	−55.66	−70.66	0.0000	0.0000	0.0728	0.0594	279.85	0.9804	1.3186
14250	14249	216.23	−56.92	−71.92	0.0000	0.0000	0.0633	0.0517	278.66	0.9650	1.2953
14500	14499	214.96	−58.19	−73.19	0.0000	0.0000	0.0542	0.0442	277.47	0.9496	1.2719
14750	14749	213.69	−59.46	−74.46	0.0000	0.0000	0.0454	0.0371	276.28	0.9342	1.2485
15000	14999	212.43	−60.72	−75.72	0.0000	0.0000	0.0370	0.0302	275.08	0.9187	1.2251
15250	15249	211.16	−61.99	−76.99	0.0000	0.0000	0.0288	0.0235	273.87	0.9032	1.2016
15500	15499	209.89	−63.26	−78.26	0.0000	0.0000	0.0210	0.0172	272.66	0.8877	1.1781
15750	15749	208.63	−64.52	−79.52	0.0000	0.0000	0.0135	0.0111	271.45	0.8722	1.1545
16000	15999	207.36	−65.79	−80.79	0.0000	0.0000	0.0064	0.0052	270.23	0.8566	1.1309
16250	16249	206.09	−67.06	−82.06	0.0000	0.0000	0.0000	0.0000	269.01	0.8410	1.1073
16500	16499	204.83	−68.32	−83.32	0.0000	0.0000	0.0000	0.0000	267.78	0.8254	1.0836
16750	16749	203.56	−69.59	−84.59	0.0000	0.0000	0.0000	0.0000	266.55	0.8098	1.0599
17000	16999	202.29	−70.86	−85.86	0.0000	0.0000	0.0000	0.0000	265.32	0.7941	1.0361
17250	17249	201.03	−72.12	−87.12	0.0000	0.0000	0.0000	0.0000	264.08	0.7784	1.0123
17500	17499	199.76	−73.39	−88.39	0.0000	0.0000	0.0000	0.0000	262.84	0.7627	0.9885
17750	17749	198.49	−74.66	−89.66	0.0000	0.0000	0.0000	0.0000	261.60	0.7470	0.9646
18000	17999	197.23	−75.92	−90.92	0.0000	0.0000	0.0000	0.0000	260.35	0.7312	0.9407
18250	18249	195.96	−77.19	−92.19	0.0000	0.0000	0.0000	0.0000	259.10	0.7154	0.9167
18500	18499	194.69	−78.46	−93.46	0.0000	0.0000	0.0000	0.0000	257.84	0.6996	0.8928
18750	18749	193.43	−79.72	−94.72	0.0000	0.0000	0.0000	0.0000	256.58	0.6838	0.8688
19000	18999	192.16	−80.99	−95.99	0.0000	0.0000	0.0000	0.0000	255.32	0.6679	0.8447
19250	19249	190.89	−82.26	−97.26	0.0000	0.0000	0.0000	0.0000	254.05	0.6520	0.8207
19500	19499	189.63	−83.52	−98.52	0.0000	0.0000	0.0000	0.0000	252.77	0.6361	0.7966
19750	19749	188.36	−84.79	−99.79	0.0000	0.0000	0.0000	0.0000	251.50	0.6202	0.7725
20000	19999	187.09	−86.06	−101.06	0.0000	0.0000	0.0000	0.0000	250.21	0.6042	0.7484
20250	20249	185.83	−87.32	−102.32	0.0000	0.0000	0.0000	0.0000	248.93	0.5882	0.7243
20500	20499	184.56	−88.59	−103.59	0.0000	0.0000	0.0000	0.0000	247.64	0.5722	0.7001
20750	20749	183.29	−89.86	−104.86	0.0000	0.0000	0.0000	0.0000	246.34	0.5562	0.6759
21000	20999	182.03	−91.12	−106.12	0.0000	0.0000	0.0000	0.0000	245.05	0.5401	0.6517
21250	21249	180.76	−92.39	−107.39	0.0000	0.0000	0.0000	0.0000	243.74	0.5240	0.6275
21500	21499	179.49	−93.66	−108.66	0.0000	0.0000	0.0000	0.0000	242.44	0.5079	0.6032
21750	21749	178.23	−94.92	−109.92	0.0000	0.0000	0.0000	0.0000	241.13	0.4918	0.5789
22000	21999	176.96	−96.19	−111.19	0.0000	0.0000	0.0000	0.0000	239.82	0.4756	0.5546
22250	22249	175.69	−97.46	−112.46	0.0000	0.0000	0.0000	0.0000	238.50	0.4594	0.5303
22500	22499	174.43	−98.72	−113.72	0.0000	0.0000	0.0000	0.0000	237.18	0.4432	0.5059
22750	22749	173.16	−99.99	−114.99	0.0000	0.0000	0.0000	0.0000	235.86	0.4270	0.4815
23000	22999	171.89	−101.26	−116.26	0.0000	0.0000	0.0000	0.0000	234.53	0.4107	0.4571
23250	23249	170.63	−102.52	−117.52	0.0000	0.0000	0.0000	0.0000	233.20	0.3944	0.4327
23500	23499	169.36	−103.79	−118.79	0.0000	0.0000	0.0000	0.0000	231.87	0.3781	0.4082
23750	23749	168.09	−105.06	−120.06	0.0000	0.0000	0.0000	0.0000	230.53	0.3618	0.3837
24000	23999	166.83	−106.32	−121.32	0.0000	0.0000	0.0000	0.0000	229.19	0.3454	0.3592
24250	24249	165.56	−107.59	−122.59	0.0000	0.0000	0.0000	0.0000	227.85	0.3290	0.3346
24500	24499	164.29	−108.86	−123.86	0.0000	0.0000	0.0000	0.0000	226.50	0.3126	0.3101
24750	24749	163.03	−110.12	−125.12	0.0000	0.0000	0.0000	0.0000	225.15	0.2962	0.2855
25000	24999	161.76	−111.39	−126.39	0.0000	0.0000	0.0000	0.0000	223.80	0.2798	0.2609

TABLE [illegible] – Continued

[illegible] N. January

GEOMETRIC ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z m	H m	T K	t °C	$T - T_m$	P mb	P/P_0	ρ kg m⁻³	ρ/ρ_0	C_s m s⁻¹	μ	k
0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 5.1 – Continued
25° N Standard Atmosphere
SI UNITS (METRIC UNITS)

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
h, m	z, m	T, K	t, °C	$T - T_{std}$, K	p, Pa	p/p_0	ρ, kg/m³	ρ/ρ_0	a, m/s	μ, kg/(m·s)	k, W/(m·K)
0	0	293.84	+20.69	+35.69	1.0132 × 10⁵	1.0000	1.2041	1.0000	343.6	1.8046 × 10⁻⁵	2.5613 × 10⁻²
200	200	292.09	+18.94	+34.09	9.9564 × 10⁴	0.9826	1.1905	1.0114	342.6	1.7999	2.5424
400	400	290.32	+17.17	+32.32	9.7844	0.9656	1.1769	1.0229	341.6	1.7952	2.5234
600	600	288.56	+15.41	+30.56	9.6145	0.9488	1.1634	1.0345	340.6	1.7905	2.5044
800	800	286.79	+13.64	+28.79	9.4466	0.9323	1.1500	1.0462	339.6	1.7858	2.4853
1000	1000	285.03	+11.88	+27.03	9.2806	0.9160	1.1367	1.0580	338.6	1.7811	2.4662
1200	1200	283.26	+10.11	+25.26	9.1166	0.8999	1.1235	1.0699	337.6	1.7764	2.4470
1400	1400	281.50	+8.35	+23.50	8.9545	0.8839	1.1104	1.0819	336.6	1.7717	2.4278
1600	1600	279.73	+6.58	+21.73	8.7943	0.8681	1.0974	1.0940	335.6	1.7670	2.4085
1800	1800	277.97	+4.82	+19.97	8.6360	0.8524	1.0845	1.1062	334.6	1.7623	2.3892
2000	2000	276.20	+3.05	+18.20	8.4796	0.8369	1.0717	1.1185	333.6	1.7576	2.3698
2200	2200	274.44	+1.29	+16.44	8.3251	0.8216	1.0590	1.1309	332.5	1.7529	2.3504
2400	2400	272.67	−0.48	+14.67	8.1725	0.8065	1.0464	1.1434	331.5	1.7482	2.3309
2600	2600	270.91	−2.24	+12.91	8.0217	0.7916	1.0339	1.1560	330.5	1.7435	2.3114
2800	2800	269.14	−4.01	+11.14	7.8728	0.7769	1.0215	1.1687	329.5	1.7388	2.2918
3000	3000	267.38	−5.77	+9.38	7.7257	0.7624	1.0092	1.1815	328.4	1.7341	2.2722
3200	3200	265.61	−7.54	+7.61	7.5804	0.7481	0.9970	1.1944	327.4	1.7294	2.2525
3400	3400	263.85	−9.30	+5.85	7.4370	0.7339	0.9849	1.2074	326.4	1.7247	2.2328
3600	3600	262.08	−11.07	+4.08	7.2953	0.7199	0.9729	1.2205	325.3	1.7200	2.2130
3800	3800	260.32	−12.83	+2.32	7.1554	0.7061	0.9610	1.2337	324.3	1.7153	2.1932
4000	4000	258.55	−14.60	+0.55	7.0173	0.6925	0.9492	1.2470	323.2	1.7106	2.1733
4200	4200	256.79	−16.36	−1.21	6.8809	0.6790	0.9375	1.2604	322.2	1.7059	2.1534
4400	4400	255.02	−18.13	−2.98	6.7462	0.6658	0.9259	1.2739	321.1	1.7012	2.1334
4600	4600	253.26	−19.89	−4.74	6.6132	0.6527	0.9144	1.2875	320.1	1.6965	2.1134
4800	4800	251.49	−21.66	−6.51	6.4819	0.6398	0.9030	1.3012	319.0	1.6918	2.0933
5000	5000	249.73	−23.42	−8.27	6.3523	0.6270	0.8917	1.3150	317.9	1.6871	2.0731
5200	5200	247.96	−25.19	−10.04	6.2243	0.6144	0.8805	1.3289	316.9	1.6824	2.0529
5400	5400	246.20	−26.95	−11.80	6.0980	0.6019	0.8694	1.3429	315.8	1.6777	2.0326
5600	5600	244.43	−28.72	−13.57	5.9733	0.5896	0.8584	1.3570	314.7	1.6730	2.0123
5800	5800	242.67	−30.48	−15.33	5.8502	0.5774	0.8475	1.3712	313.6	1.6683	1.9919
6000	6000	240.90	−32.25	−17.10	5.7287	0.5654	0.8367	1.3855	312.5	1.6636	1.9714
6200	6200	239.14	−34.01	−18.86	5.6088	0.5536	0.8260	1.3999	311.5	1.6589	1.9509
6400	6400	237.37	−35.78	−20.63	5.4904	0.5419	0.8154	1.4144	310.4	1.6542	1.9303
6600	6600	235.61	−37.54	−22.39	5.3736	0.5304	0.8048	1.4290	309.3	1.6495	1.9097
6800	6800	233.84	−39.31	−24.16	5.2583	0.5190	0.7944	1.4437	308.2	1.6448	1.8890
7000	7000	232.08	−41.07	−25.92	5.1445	0.5078	0.7840	1.4585	307.1	1.6401	1.8683
7200	7200	230.31	−42.84	−27.69	5.0322	0.4967	0.7737	1.4734	306.0	1.6354	1.8475
7400	7400	228.55	−44.60	−29.45	4.9214	0.4858	0.7635	1.4884	305.0	1.6307	1.8267
7600	7600	226.78	−46.37	−31.22	4.8120	0.4750	0.7534	1.5035	303.9	1.6260	1.8058
7800	7800	225.02	−48.13	−32.98	4.7041	0.4643	0.7434	1.5187	302.8	1.6213	1.7849
8000	8000	223.25	−49.90	−34.75	4.5976	0.4538	0.7334	1.5340	301.7	1.6166	1.7639
8200	8200	221.49	−51.66	−36.51	4.4925	0.4435	0.7235	1.5494	300.6	1.6119	1.7429
8400	8400	219.72	−53.43	−38.28	4.3888	0.4333	0.7137	1.5649	299.5	1.6072	1.7218
8600	8600	217.96	−55.19	−40.04	4.2865	0.4232	0.7040	1.5805	298.4	1.6025	1.7007
8800	8800	216.19	−56.96	−41.81	4.1855	0.4133	0.6943	1.5962	297.3	1.5978	1.6795
9000	9000	214.43	−58.72	−43.57	4.0859	0.4034	0.6847	1.6120	296.2	1.5931	1.6583
9200	9200	212.66	−60.49	−45.34	3.9876	0.3937	0.6752	1.6279	295.1	1.5884	1.6370
9400	9400	210.90	−62.25	−47.10	3.8906	0.3841	0.6657	1.6439	294.0	1.5837	1.6157
9600	9600	209.13	−64.02	−48.87	3.7949	0.3747	0.6564	1.6600	292.9	1.5790	1.5943
9800	9800	207.37	−65.78	−50.63	3.7005	0.3654	0.6471	1.6762	291.8	1.5743	1.5729
10000	10000	205.60	−67.55	−52.40	3.6074	0.3562	0.6379	1.6925	290.7	1.5696	1.5514
10200	10200	203.84	−69.31	−54.16	3.5156	0.3471	0.6288	1.7089	289.6	1.5649	1.5299
10400	10400	202.07	−71.08	−55.93	3.4250	0.3382	0.6198	1.7254	288.5	1.5602	1.5083
10600	10600	200.31	−72.84	−57.69	3.3357	0.3294	0.6109	1.7420	287.4	1.5555	1.4867
10800	10800	198.54	−74.61	−59.46	3.2476	0.3207	0.6021	1.7587	286.3	1.5508	1.4650
11000	11000	196.78	−76.37	−61.22	3.1608	0.3121	0.5933	1.7755	285.2	1.5461	1.4433
11200	11200	195.01	−78.14	−62.99	3.0751	0.3036	0.5846	1.7924	284.1	1.5414	1.4215
11400	11400	193.25	−79.90	−64.75	2.9907	0.2953	0.5760	1.8094	283.0	1.5367	1.3997
11600	11600	191.48	−81.67	−66.52	2.9074	0.2871	0.5675	1.8265	281.9	1.5320	1.3778
11800	11800	189.72	−83.43	−68.28	2.8253	0.2789	0.5590	1.8437	280.8	1.5273	1.3559
12000	12000	187.95	−85.20	−70.05	2.7444	0.2709	0.5506	1.8610	279.7	1.5226	1.3339
12200	12200	186.19	−86.96	−71.81	2.6646	0.2630	0.5423	1.8784	278.6	1.5179	1.3119
12400	12400	184.42	−88.73	−73.58	2.5860	0.2553	0.5341	1.8959	277.5	1.5132	1.2898
12600	12600	182.66	−90.49	−75.34	2.5085	0.2476	0.5259	1.9135	276.4	1.5085	1.2677
12800	12800	180.89	−92.26	−77.11	2.4321	0.2401	0.5178	1.9312	275.3	1.5038	1.2455
13000	13000	179.13	−94.02	−78.87	2.3568	0.2327	0.5098	1.9490	274.2	1.4991	1.2233
13200	13200	177.36	−95.79	−80.64	2.2826	0.2253	0.5018	1.9669	273.1	1.4944	1.2010
13400	13400	175.60	−97.55	−82.40	2.2095	0.2181	0.4939	1.9849	272.0	1.4897	1.1787
13600	13600	173.83	−99.32	−84.17	2.1375	0.2110	0.4860	2.0030	270.9	1.4850	1.1563
13800	13800	172.07	−101.08	−85.93	2.0665	0.2040	0.4782	2.0212	269.8	1.4803	1.1339
14000	14000	170.30	−102.85	−87.70	1.9966	0.1971	0.4704	2.0395	268.7	1.4756	1.1114
14200	14200	168.54	−104.61	−89.46	1.9277	0.1903	0.4627	2.0579	267.6	1.4709	1.0889
14400	14400	166.77	−106.38	−91.23	1.8598	0.1836	0.4551	2.0764	266.5	1.4662	1.0664
14600	14600	165.01	−108.14	−92.99	1.7929	0.1770	0.4475	2.0950	265.4	1.4615	1.0438
14800	14800	163.24	−109.91	−94.76	1.7271	0.1705	0.4400	2.1137	264.3	1.4568	1.0211
15000	15000	161.48	−111.67	−96.52	1.6622	0.1641	0.4325	2.1325	263.2	1.4521	0.9984
15200	15200	159.71	−113.44	−98.29	1.5983	0.1578	0.4250	2.1514	262.1	1.4474	0.9757
15400	15400	157.95	−115.20	−100.05	1.5354	0.1516	0.4176	2.1704	261.0	1.4427	0.9529
15600	15600	156.18	−116.97	−101.82	1.4735	0.1455	0.4103	2.1895	259.9	1.4380	0.9301
15800	15800	154.42	−118.73	−103.58	1.4125	0.1395	0.4030	2.2087	258.8	1.4333	0.9072
16000	16000	152.65	−120.50	−105.35	1.3525	0.1335	0.3957	2.2280	257.7	1.4286	0.8843
16200	16200	150.89	−122.26	−107.11	1.2935	0.1277	0.3885	2.2474	256.6	1.4239	0.8614
16400	16400	149.12	−124.03	−108.88	1.2354	0.1220	0.3814	2.2669	255.5	1.4192	0.8384
16600	16600	147.36	−125.79	−110.64	1.1782	0.1163	0.3743	2.2865	254.4	1.4145	0.8153
16800	16800	145.59	−127.56	−112.41	1.1220	0.1108	0.3673	2.3062	253.3	1.4098	0.7922
17000	17000	143.83	−129.32	−114.17	1.0667	0.1053	0.3603	2.3260	252.2	1.4051	0.7691
17200	17200	142.06	−131.09	−115.94	1.0123	0.0999	0.3533	2.3459	251.1	1.4004	0.7459
17400	17400	140.30	−132.85	−117.70	0.9588	0.0947	0.3464	2.3659	250.0	1.3957	0.7227
17600	17600	138.53	−134.62	−119.47	0.9062	0.0895	0.3396	2.3860	248.9	1.3910	0.6994
17800	17800	136.77	−136.38	−121.23	0.8545	0.0844	0.3328	2.4062	247.8	1.3863	0.6761
18000	18000	135.00	−138.15	−123.00	0.8036	0.0793	0.3260	2.4265	246.7	1.3816	0.6528
18200	18200	133.24	−139.91	−124.76	0.7537	0.0744	0.3193	2.4469	245.6	1.3769	0.6294
18400	18400	131.47	−141.68	−126.53	0.7046	0.0696	0.3127	2.4674	244.5	1.3722	0.6060
18600	18600	129.71	−143.44	−128.29	0.6564	0.0648	0.3061	2.4880	243.4	1.3675	0.5826
18800	18800	127.94	−145.21	−130.06	0.6090	0.0601	0.2996	2.5087	242.3	1.3628	0.5591
19000	19000	126.18	−146.97	−131.82	0.5625	0.0555	0.2931	2.5295	241.2	1.3581	0.5356
19200	19200	124.41	−148.74	−133.59	0.5168	0.0510	0.2866	2.5504	240.1	1.3534	0.5120
19400	19400	122.65	−150.50	−135.35	0.4720	0.0466	0.2802	2.5714	239.0	1.3487	0.4884
19600	19600	120.88	−152.27	−137.12	0.4280	0.0422	0.2738	2.5925	237.9	1.3440	0.4648
19800	19800	119.12	−154.03	−138.88	0.3849	0.0380	0.2675	2.6137	236.8	1.3393	0.4411
20000	20000	117.35	−155.80	−140.65	0.3425	0.0338	0.2612	2.6350	235.7	1.3346	0.4174
20200	20200	115.59	−157.56	−142.41	0.3010	0.0297	0.2549	2.6564	234.6	1.3299	0.3936
20400	20400	113.82	−159.33	−144.18	0.2602	0.0257	0.2487	2.6779	233.5	1.3252	0.3698
20600	20600	112.06	−161.09	−145.94	0.2203	0.0217	0.2425	2.6995	232.4	1.3205	0.3460
20800	20800	110.29	−162.86	−147.71	0.1811	0.0179	0.2364	2.7212	231.3	1.3158	0.3221
21000	21000	108.53	−164.62	−149.47	0.1427	0.0141	0.2303	2.7430	230.2	1.3111	0.2982
21200	21200	106.76	−166.39	−151.24	0.1050	0.0104	0.2243	2.7649	229.1	1.3064	0.2742
21400	21400	105.00	−168.15	−153.00	0.0681	0.0067	0.2183	2.7869	228.0	1.3017	0.2502
21600	21600	103.23	−169.92	−154.77	0.0319	0.0032	0.2123	2.8090	226.9	1.2970	0.2261
21800	21800	101.47	−171.68	−156.53	0.0000	0.0000	0.2064	2.8312	225.8	1.2923	0.2020

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Table 3.1 – Continued

[illegible]

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
H, m	Z, m	T, K	t, °C	T/T_{SL}	p, mb	p/p_{SL}	ρ, kg m^{-3}	ρ/ρ_{SL}	a, m s^{-1}	μ, kg m^{-1} s^{-1}	k, W m^{-1} K^{-1}
[illegible]											

Table 5.1 – Continued
[illegible]
GEOMETRIC ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, m	H, m	T, K	t, °C	[illegible]	P, mb	[illegible]	ρ, kg m⁻³	[illegible]	C_s, m/sec	μ, [illegible]	k, [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 5? — Continued

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GEOPOTENTIAL ALTITUDE, METRIC UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, m	Z, m	T, K	t, °C	[illegible]	P, mb	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]		[illegible]			[illegible]		[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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Table 5.2

Sea level to 390,000 ft

TEMPERATURE, PRESSURE, DENSITY, SOUND SPEED, COEFFICIENT OF VISCOSITY AND THERMAL CONDUCTIVITY

English Units

TABLE 5.2

[illegible]

[illegible]

[illegible]		[illegible]			[illegible]		[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
z, km	H, km	T, °K	t, °C	$T - T_{sl}$, °K	p, mb	$\frac{p}{p_{sl}}$	ρ, g/m³	$\frac{\rho}{\rho_{sl}}$	a, m/sec	μ, kg/m-sec	k, cal/m-sec-°K
0	0	288.16	15.00	0.00	1.013 × 10³	1.0000	1.225 × 10³	1.0000	340.43	1.789 × 10⁻⁵	5.806 × 10⁻⁶
1.000	1.000	281.66	8.50	-6.50	8.988 × 10²	0.8870	1.112 × 10³	0.9075	336.43	1.758 × 10⁻⁵	5.694 × 10⁻⁶
2.000	1.999	275.16	2.00	-13.00	7.950 × 10²	0.7846	1.007 × 10³	0.8217	332.38	1.726 × 10⁻⁵	5.580 × 10⁻⁶
3.000	2.999	268.66	-4.50	-19.50	7.012 × 10²	0.6920	9.093 × 10²	0.7423	328.28	1.694 × 10⁻⁵	5.464 × 10⁻⁶
4.000	3.998	262.16	-11.00	-26.00	6.166 × 10²	0.6085	8.194 × 10²	0.6689	324.12	1.661 × 10⁻⁵	5.345 × 10⁻⁶
5.000	4.997	255.66	-17.50	-32.50	5.405 × 10²	0.5334	7.364 × 10²	0.6010	319.91	1.628 × 10⁻⁵	5.223 × 10⁻⁶
6.000	5.996	249.16	-24.00	-39.00	4.722 × 10²	0.4660	6.601 × 10²	0.5387	315.64	1.595 × 10⁻⁵	5.098 × 10⁻⁶
7.000	6.995	242.66	-30.50	-45.50	4.111 × 10²	0.4057	5.900 × 10²	0.4817	311.31	1.561 × 10⁻⁵	4.971 × 10⁻⁶
8.000	7.994	236.16	-37.00	-52.00	3.565 × 10²	0.3519	5.258 × 10²	0.4292	306.91	1.527 × 10⁻⁵	4.840 × 10⁻⁶
9.000	8.993	229.66	-43.50	-58.50	3.080 × 10²	0.3040	4.671 × 10²	0.3813	302.46	1.492 × 10⁻⁵	4.706 × 10⁻⁶
10.000	9.992	223.16	-50.00	-65.00	2.650 × 10²	0.2615	4.135 × 10²	0.3376	297.94	1.457 × 10⁻⁵	4.569 × 10⁻⁶
11.000	10.990	216.66	-56.50	-71.50	2.270 × 10²	0.2240	3.648 × 10²	0.2978	293.35	1.422 × 10⁻⁵	4.428 × 10⁻⁶
12.000	11.989	216.66	-56.50	-71.50	1.940 × 10²	0.1915	3.119 × 10²	0.2546	295.07	1.422 × 10⁻⁵	4.428 × 10⁻⁶
13.000	12.988	216.66	-56.50	-71.50	1.658 × 10²	0.1636	2.666 × 10²	0.2176	295.07	1.422 × 10⁻⁵	4.428 × 10⁻⁶
14.000	13.987	216.66	-56.50	-71.50	1.417 × 10²	0.1399	2.279 × 10²	0.1860	295.07	1.422 × 10⁻⁵	4.428 × 10⁻⁶
15.000	14.986	216.66	-56.50	-71.50	1.211 × 10²	0.1195	1.948 × 10²	0.1590	295.07	1.422 × 10⁻⁵	4.428 × 10⁻⁶
16.000	15.985	216.66	-56.50	-71.50	1.035 × 10²	0.1022	1.665 × 10²	0.1359	295.07	1.422 × 10⁻⁵	4.428 × 10⁻⁶
17.000	16.984	216.66	-56.50	-71.50	8.850 × 10¹	0.0873	1.423 × 10²	0.1162	295.07	1.422 × 10⁻⁵	4.428 × 10⁻⁶
18.000	17.983	216.66	-56.50	-71.50	7.565 × 10¹	0.0747	1.216 × 10²	0.0992	295.07	1.422 × 10⁻⁵	4.428 × 10⁻⁶
19.000	18.982	216.66	-56.50	-71.50	6.467 × 10¹	0.0638	1.040 × 10²	0.0849	295.07	1.422 × 10⁻⁵	4.428 × 10⁻⁶
20.000	19.981	216.66	-56.50	-71.50	5.529 × 10¹	0.0546	8.890 × 10¹	0.0725	295.07	1.422 × 10⁻⁵	4.428 × 10⁻⁶
21.000	20.980	217.58	-55.58	-70.58	4.729 × 10¹	0.0467	7.599 × 10¹	0.0620	295.60	1.426 × 10⁻⁵	4.441 × 10⁻⁶
22.000	21.979	218.57	-54.59	-69.59	4.047 × 10¹	0.0400	6.501 × 10¹	0.0531	296.19	1.430 × 10⁻⁵	4.455 × 10⁻⁶
23.000	22.978	219.57	-53.59	-68.59	3.467 × 10¹	0.0342	5.565 × 10¹	0.0454	296.79	1.434 × 10⁻⁵	4.469 × 10⁻⁶
24.000	23.977	220.56	-52.60	-67.60	2.972 × 10¹	0.0293	4.767 × 10¹	0.0389	297.38	1.438 × 10⁻⁵	4.483 × 10⁻⁶
25.000	24.976	221.55	-51.60	-66.60	2.549 × 10¹	0.0251	4.085 × 10¹	0.0333	297.98	1.442 × 10⁻⁵	4.497 × 10⁻⁶
26.000	25.975	222.55	-50.60	-65.60	2.189 × 10¹	0.0216	3.504 × 10¹	0.0286	298.57	1.446 × 10⁻⁵	4.511 × 10⁻⁶
27.000	26.974	223.54	-49.61	-64.61	1.882 × 10¹	0.0186	3.010 × 10¹	0.0246	299.17	1.450 × 10⁻⁵	4.525 × 10⁻⁶
28.000	27.973	224.54	-48.61	-63.61	1.620 × 10¹	0.0160	2.593 × 10¹	0.0212	299.76	1.454 × 10⁻⁵	4.539 × 10⁻⁶
29.000	28.972	225.53	-47.62	-62.62	1.398 × 10¹	0.0138	2.238 × 10¹	0.0183	300.35	1.458 × 10⁻⁵	4.553 × 10⁻⁶
30.000	29.971	226.53	-46.62	-61.62	1.209 × 10¹	0.0119	1.934 × 10¹	0.0158	300.94	1.462 × 10⁻⁵	4.567 × 10⁻⁶
31.000	30.970	227.52	-45.63	-60.63	1.047 × 10¹	0.0103	1.673 × 10¹	0.0137	301.53	1.466 × 10⁻⁵	4.581 × 10⁻⁶
32.000	31.969	228.52	-44.63	-59.63	9.072 × 10⁰	0.0089	1.450 × 10¹	0.0118	302.12	1.470 × 10⁻⁵	4.595 × 10⁻⁶
33.000	32.968	229.51	-43.64	-58.64	7.882 × 10⁰	0.0078	1.260 × 10¹	0.0103	302.71	1.474 × 10⁻⁵	4.609 × 10⁻⁶
34.000	33.967	230.51	-42.64	-57.64	6.858 × 10⁰	0.0068	1.097 × 10¹	0.0089	303.30	1.478 × 10⁻⁵	4.623 × 10⁻⁶
35.000	34.966	231.50	-41.65	-56.65	5.980 × 10⁰	0.0059	9.566 × 10⁰	0.0078	303.89	1.482 × 10⁻⁵	4.637 × 10⁻⁶
36.000	35.965	232.50	-40.65	-55.65	5.227 × 10⁰	0.0052	8.365 × 10⁰	0.0068	304.48	1.486 × 10⁻⁵	4.651 × 10⁻⁶
37.000	36.964	233.49	-39.66	-54.66	4.584 × 10⁰	0.0045	7.338 × 10⁰	0.0060	305.07	1.490 × 10⁻⁵	4.665 × 10⁻⁶
38.000	37.963	234.49	-38.66	-53.66	4.036 × 10⁰	0.0040	6.460 × 10⁰	0.0053	305.66	1.494 × 10⁻⁵	4.679 × 10⁻⁶
39.000	38.962	235.48	-37.67	-52.67	3.567 × 10⁰	0.0035	5.709 × 10⁰	0.0047	306.25	1.498 × 10⁻⁵	4.693 × 10⁻⁶
40.000	39.961	236.48	-36.67	-51.67	3.166 × 10⁰	0.0031	5.067 × 10⁰	0.0041	306.84	1.502 × 10⁻⁵	4.707 × 10⁻⁶
41.000	40.960	237.47	-35.68	-50.68	2.817 × 10⁰	0.0028	4.509 × 10⁰	0.0037	307.43	1.506 × 10⁻⁵	4.721 × 10⁻⁶
42.000	41.959	238.47	-34.68	-49.68	2.513 × 10⁰	0.0025	4.023 × 10⁰	0.0033	308.02	1.510 × 10⁻⁵	4.735 × 10⁻⁶
43.000	42.958	239.46	-33.69	-48.69	2.248 × 10⁰	0.0022	3.600 × 10⁰	0.0029	308.61	1.514 × 10⁻⁵	4.749 × 10⁻⁶
44.000	43.957	240.46	-32.69	-47.69	2.016 × 10⁰	0.0020	3.229 × 10⁰	0.0026	309.20	1.518 × 10⁻⁵	4.763 × 10⁻⁶
45.000	44.956	241.45	-31.70	-46.70	1.811 × 10⁰	0.0018	2.902 × 10⁰	0.0024	309.79	1.522 × 10⁻⁵	4.777 × 10⁻⁶
46.000	45.955	242.45	-30.70	-45.70	1.630 × 10⁰	0.0016	2.613 × 10⁰	0.0021	310.38	1.526 × 10⁻⁵	4.791 × 10⁻⁶
47.000	46.954	243.44	-29.71	-44.71	1.469 × 10⁰	0.0014	2.356 × 10⁰	0.0019	310.97	1.530 × 10⁻⁵	4.805 × 10⁻⁶
48.000	47.953	244.44	-28.71	-43.71	1.326 × 10⁰	0.0013	2.127 × 10⁰	0.0017	311.56	1.534 × 10⁻⁵	4.819 × 10⁻⁶
49.000	48.952	245.43	-27.72	-42.72	1.199 × 10⁰	0.0012	1.924 × 10⁰	0.0016	312.15	1.538 × 10⁻⁵	4.833 × 10⁻⁶
50.000	49.951	246.43	-26.72	-41.72	1.085 × 10⁰	0.0011	1.743 × 10⁰	0.0014	312.74	1.542 × 10⁻⁵	4.847 × 10⁻⁶
51.000	50.950	247.42	-25.73	-40.73	9.836 × 10⁻¹	0.0010	1.581 × 10⁰	0.0013	313.33	1.546 × 10⁻⁵	4.861 × 10⁻⁶
52.000	51.949	248.42	-24.73	-39.73	8.918 × 10⁻¹	0.0009	1.436 × 10⁰	0.0012	313.92	1.550 × 10⁻⁵	4.875 × 10⁻⁶
53.000	52.948	249.41	-23.74	-38.74	8.090 × 10⁻¹	0.0008	1.305 × 10⁰	0.0011	314.51	1.554 × 10⁻⁵	4.889 × 10⁻⁶
54.000	53.947	250.41	-22.74	-37.74	7.340 × 10⁻¹	0.0007	1.187 × 10⁰	0.0010	315.10	1.558 × 10⁻⁵	4.903 × 10⁻⁶
55.000	54.946	251.40	-21.75	-36.75	6.660 × 10⁻¹	0.0007	1.080 × 10⁰	0.0009	315.69	1.562 × 10⁻⁵	4.917 × 10⁻⁶
56.000	55.945	252.40	-20.75	-35.75	6.044 × 10⁻¹	0.0006	9.833 × 10⁻¹	0.0008	316.28	1.566 × 10⁻⁵	4.931 × 10⁻⁶
57.000	56.944	253.39	-19.76	-34.76	5.486 × 10⁻¹	0.0005	8.951 × 10⁻¹	0.0007	316.87	1.570 × 10⁻⁵	4.945 × 10⁻⁶
58.000	57.943	254.39	-18.76	-33.76	4.980 × 10⁻¹	0.0005	8.149 × 10⁻¹	0.0007	317.46	1.574 × 10⁻⁵	4.959 × 10⁻⁶
59.000	58.942	255.38	-17.77	-32.77	4.522 × 10⁻¹	0.0004	7.420 × 10⁻¹	0.0006	318.05	1.578 × 10⁻⁵	4.973 × 10⁻⁶
60.000	59.941	256.38	-16.77	-31.77	4.107 × 10⁻¹	0.0004	6.757 × 10⁻¹	0.0006	318.64	1.582 × 10⁻⁵	4.987 × 10⁻⁶
61.000	60.940	257.37	-15.78	-30.78	3.730 × 10⁻¹	0.0004	6.155 × 10⁻¹	0.0005	319.23	1.586 × 10⁻⁵	5.001 × 10⁻⁶
62.000	61.939	258.37	-14.78	-29.78	3.388 × 10⁻¹	0.0003	5.608 × 10⁻¹	0.0005	319.82	1.590 × 10⁻⁵	5.015 × 10⁻⁶
63.000	62.938	259.36	-13.79	-28.79	3.078 × 10⁻¹	0.0003	5.112 × 10⁻¹	0.0004	320.41	1.594 × 10⁻⁵	5.029 × 10⁻⁶
64.000	63.937	260.36	-12.79	-27.79	2.797 × 10⁻¹	0.0003	4.661 × 10⁻¹	0.0004	321.00	1.598 × 10⁻⁵	5.043 × 10⁻⁶
65.000	64.936	261.35	-11.80	-26.80	2.542 × 10⁻¹	0.0003	4.251 × 10⁻¹	0.0003	321.59	1.602 × 10⁻⁵	5.057 × 10⁻⁶
66.000	65.935	262.35	-10.80	-25.80	2.311 × 10⁻¹	0.0002	3.877 × 10⁻¹	0.0003	322.18	1.606 × 10⁻⁵	5.071 × 10⁻⁶
67.000	66.934	263.34	-9.81	-24.81	2.101 × 10⁻¹	0.0002	3.536 × 10⁻¹	0.0003	322.77	1.610 × 10⁻⁵	5.085 × 10⁻⁶
68.000	67.933	264.34	-8.81	-23.81	1.910 × 10⁻¹	0.0002	3.225 × 10⁻¹	0.0003	323.36	1.614 × 10⁻⁵	5.099 × 10⁻⁶
69.000	68.932	265.33	-7.82	-22.82	1.736 × 10⁻¹	0.0002	2.941 × 10⁻¹	0.0002	323.95	1.618 × 10⁻⁵	5.113 × 10⁻⁶
70.000	69.931	266.33	-6.82	-21.82	1.578 × 10⁻¹	0.0002	2.683 × 10⁻¹	0.0002	324.54	1.622 × 10⁻⁵	5.127 × 10⁻⁶

TABLE XX.—Continued

35° N. Latitude

GEOPOTENTIAL ALTITUDE TABLE (SI UNITS)

Altitude		Temperature			Pressure		Density		Speed of sound	Gravity correction factor	Thermal conductivity
H, km	Z, km	t, °F	t, °C	T, °K	P, mb	$\frac{P}{P_{sea}}$	ρ, kg/m³	$\frac{\rho}{\rho_{sea}}$	a, m/sec	$\frac{g_0}{g}$	k, $\frac{cal}{cm\ sec\ °K}$
0	0	59.00	15.00	288.15	1.013 × 10³	1.0000	1.225 × 10⁰	1.0000	340.4	0.9966	5.76 × 10⁻⁵
1000	1000	55.43	13.02	286.17	8.988 × 10²	0.8870	1.112 × 10⁰	0.9075	338.9	0.9963	5.70 × 10⁻⁵
2000	2000	51.87	10.93	284.08	7.950 × 10²	0.7846	1.007 × 10⁰	0.8217	337.3	0.9960	5.64 × 10⁻⁵
3000	3000	48.30	9.06	282.21	7.012 × 10²	0.6920	9.093 × 10⁻¹	0.7423	335.8	0.9957	5.58 × 10⁻⁵
4000	4000	44.74	7.08	280.23	6.166 × 10²	0.6085	8.194 × 10⁻¹	0.6689	334.3	0.9954	5.52 × 10⁻⁵
5000	5000	41.17	5.09	278.24	5.405 × 10²	0.5334	7.364 × 10⁻¹	0.6010	332.8	0.9951	5.46 × 10⁻⁵
6000	6000	37.60	3.11	276.26	4.722 × 10²	0.4660	6.601 × 10⁻¹	0.5387	331.3	0.9948	5.40 × 10⁻⁵
7000	7000	34.04	1.13	274.28	4.111 × 10²	0.4057	5.900 × 10⁻¹	0.4817	329.7	0.9945	5.34 × 10⁻⁵
8000	8000	30.47	−0.86	272.29	3.565 × 10²	0.3518	5.258 × 10⁻¹	0.4292	328.2	0.9942	5.28 × 10⁻⁵
9000	9000	26.91	−2.84	270.31	3.080 × 10²	0.3040	4.671 × 10⁻¹	0.3813	326.7	0.9939	5.22 × 10⁻⁵
10000	9999	23.34	−4.81	268.32	2.650 × 10²	0.2615	4.135 × 10⁻¹	0.3376	325.2	0.9936	5.16 × 10⁻⁵
11000	10999	19.78	−6.79	266.34	2.270 × 10²	0.2240	3.648 × 10⁻¹	0.2978	323.6	0.9933	5.10 × 10⁻⁵
12000	11999	16.21	−8.77	264.35	1.936 × 10²	0.1911	3.204 × 10⁻¹	0.2616	322.1	0.9930	5.04 × 10⁻⁵
13000	12998	12.65	−10.74	262.37	1.645 × 10²	0.1624	2.801 × 10⁻¹	0.2287	320.5	0.9927	4.98 × 10⁻⁵
14000	13998	9.08	−12.72	260.38	1.392 × 10²	0.1374	2.436 × 10⁻¹	0.1989	319.0	0.9924	4.92 × 10⁻⁵
15000	14997	5.52	−14.69	258.40	1.175 × 10²	0.1160	2.108 × 10⁻¹	0.1721	317.4	0.9921	4.86 × 10⁻⁵
16000	15996	1.95	−16.67	256.41	9.879 × 10¹	0.09754	1.815 × 10⁻¹	0.1481	315.8	0.9918	4.80 × 10⁻⁵
17000	16995	−1.61	−18.64	254.43	8.292 × 10¹	0.08187	1.554 × 10⁻¹	0.1267	314.3	0.9915	4.74 × 10⁻⁵
18000	17994	−5.18	−20.62	252.44	6.946 × 10¹	0.06857	1.323 × 10⁻¹	0.1079	312.7	0.9912	4.68 × 10⁻⁵
19000	18993	−8.74	−22.59	250.46	5.802 × 10¹	0.05728	1.120 × 10⁻¹	0.09135	311.1	0.9909	4.62 × 10⁻⁵
20000	19992	−12.31	−24.57	248.47	4.832 × 10¹	0.04769	9.467 × 10⁻²	0.07717	309.6	0.9906	4.56 × 10⁻⁵
21000	20991	−15.87	−26.54	246.49	4.010 × 10¹	0.03958	7.972 × 10⁻²	0.06500	308.0	0.9903	4.50 × 10⁻⁵
22000	21990	−19.44	−28.52	244.50	3.315 × 10¹	0.03272	6.700 × 10⁻²	0.05463	306.4	0.9900	4.44 × 10⁻⁵
23000	22989	−23.00	−30.49	242.52	2.730 × 10¹	0.02694	5.624 × 10⁻²	0.04585	304.8	0.9897	4.38 × 10⁻⁵
24000	23988	−26.57	−32.47	240.53	2.242 × 10¹	0.02213	4.717 × 10⁻²	0.03846	303.2	0.9894	4.32 × 10⁻⁵
25000	24987	−30.13	−34.44	238.55	1.841 × 10¹	0.01817	3.955 × 10⁻²	0.03225	301.7	0.9891	4.26 × 10⁻⁵
26000	25986	−33.70	−36.42	236.56	1.510 × 10¹	0.01491	3.315 × 10⁻²	0.02703	300.1	0.9888	4.20 × 10⁻⁵
27000	26985	−37.26	−38.39	234.58	1.237 × 10¹	0.01221	2.778 × 10⁻²	0.02265	298.5	0.9885	4.14 × 10⁻⁵
28000	27984	−40.83	−40.37	232.59	1.012 × 10¹	0.009989	2.326 × 10⁻²	0.01896	296.9	0.9882	4.08 × 10⁻⁵
29000	28983	−44.39	−42.34	230.61	8.282 × 10⁰	0.008176	1.947 × 10⁻²	0.01587	295.3	0.9879	4.02 × 10⁻⁵
30000	29982	−47.96	−44.31	228.62	6.779 × 10⁰	0.006690	1.631 × 10⁻²	0.01329	293.8	0.9876	3.96 × 10⁻⁵
31000	30981	−51.52	−46.29	226.64	5.548 × 10⁰	0.005475	1.366 × 10⁻²	0.01113	292.2	0.9873	3.90 × 10⁻⁵
32000	31980	−55.09	−48.26	224.65	4.540 × 10⁰	0.004481	1.144 × 10⁻²	0.009324	290.6	0.9870	3.84 × 10⁻⁵
33000	32979	−58.65	−50.24	222.67	3.716 × 10⁰	0.003668	9.584 × 10⁻³	0.007811	289.0	0.9867	3.78 × 10⁻⁵
34000	33978	−62.22	−52.21	220.68	3.042 × 10⁰	0.003003	8.030 × 10⁻³	0.006545	287.4	0.9864	3.72 × 10⁻⁵
35000	34977	−65.78	−54.19	218.70	2.491 × 10⁰	0.002459	6.729 × 10⁻³	0.005484	285.8	0.9861	3.66 × 10⁻⁵
36000	35976	−69.35	−56.16	216.71	2.040 × 10⁰	0.002014	5.638 × 10⁻³	0.004596	284.3	0.9858	3.60 × 10⁻⁵
37000	36975	−72.91	−58.14	214.73	1.671 × 10⁰	0.001649	4.726 × 10⁻³	0.003852	282.7	0.9855	3.54 × 10⁻⁵
38000	37974	−76.48	−60.11	212.74	1.368 × 10⁰	0.001350	3.960 × 10⁻³	0.003228	281.1	0.9852	3.48 × 10⁻⁵
39000	38973	−80.04	−62.09	210.76	1.121 × 10⁰	0.001106	3.319 × 10⁻³	0.002705	279.5	0.9849	3.42 × 10⁻⁵
40000	39972	−83.61	−64.06	208.77	9.180 × 10⁻¹	0.0009062	2.781 × 10⁻³	0.002267	277.9	0.9846	3.36 × 10⁻⁵
41000	40971	−87.17	−66.04	206.79	7.520 × 10⁻¹	0.0007424	2.331 × 10⁻³	0.001900	276.4	0.9843	3.30 × 10⁻⁵
42000	41970	−90.74	−68.01	204.80	6.160 × 10⁻¹	0.0006081	1.954 × 10⁻³	0.001593	274.8	0.9840	3.24 × 10⁻⁵
43000	42969	−94.30	−69.99	202.82	5.045 × 10⁻¹	0.0004980	1.638 × 10⁻³	0.001335	273.2	0.9837	3.18 × 10⁻⁵
44000	43968	−97.87	−71.96	200.83	4.132 × 10⁻¹	0.0004079	1.373 × 10⁻³	0.001120	271.6	0.9834	3.12 × 10⁻⁵
45000	44967	−101.43	−73.94	198.85	3.384 × 10⁻¹	0.0003341	1.151 × 10⁻³	0.0009391	270.0	0.9831	3.06 × 10⁻⁵
46000	45966	−105.00	−75.91	196.86	2.772 × 10⁻¹	0.0002736	9.648 × 10⁻⁴	0.0007874	268.4	0.9828	3.00 × 10⁻⁵
47000	46965	−108.56	−77.89	194.88	2.270 × 10⁻¹	0.0002241	8.087 × 10⁻⁴	0.0006602	266.8	0.9825	2.94 × 10⁻⁵
48000	47964	−112.13	−79.86	192.89	1.859 × 10⁻¹	0.0001835	6.779 × 10⁻⁴	0.0005534	265.2	0.9822	2.88 × 10⁻⁵
49000	48963	−115.69	−81.84	190.91	1.522 × 10⁻¹	0.0001502	5.683 × 10⁻⁴	0.0004638	263.6	0.9819	2.82 × 10⁻⁵
50000	49962	−119.26	−83.81	188.92	1.246 × 10⁻¹	0.0001230	4.764 × 10⁻⁴	0.0003887	262.0	0.9816	2.76 × 10⁻⁵

Table 3.2 - (continued)

15° N. Lat.

GEOMETRIC ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
H, ft	H, ft	T, °R	t, °F	$T - T_{SL}$, °R	P, lb/ft²	$\frac{P}{P_{SL}}$	ρ, lb-sec²/ft⁴	$\frac{\rho}{\rho_{SL}}$	a, ft/sec	μ, lb-sec/ft²	k, $\frac{Btu}{ft\text{-}sec\text{-}°R}$
0	0	539.67	59.00	0.00	2.1162	1.0000	2.3769 - 3	1.0000	1116.5	3.737 - 7	1.279 - 6
1000	1000	537.30	56.63	-2.37	2.0360	0.9621	2.3668	0.9957	1113.8	3.728	1.275
2000	2000	534.93	54.26	-4.74	1.9579	0.9251	2.3567	0.9915	1111.2	3.719	1.272
3000	3000	532.56	51.89	-7.11	1.8818	0.8892	2.3467	0.9872	1108.5	3.710	1.269
4000	4000	530.19	49.52	-9.48	1.8078	0.8543	2.3367	0.9830	1105.9	3.701	1.266
5000	5000	527.82	47.15	-11.85	1.7357	0.8203	2.3268	0.9787	1103.2	3.692	1.263
6000	6000	525.45	44.78	-14.22	1.6656	0.7872	2.3169	0.9745	1100.5	3.683	1.260
7000	7000	523.08	42.41	-16.59	1.5974	0.7550	2.3070	0.9703	1097.9	3.674	1.257
8000	8000	520.71	40.04	-18.96	1.5312	0.7238	2.2972	0.9661	1095.2	3.665	1.254
9000	9000	518.34	37.67	-21.33	1.4668	0.6933	2.2874	0.9619	1092.5	3.656	1.251
10000	10000	515.97	35.30	-23.70	1.4042	0.6638	2.2777	0.9577	1089.8	3.647	1.248
11000	11000	513.60	32.93	-26.07	1.3434	0.6350	2.2680	0.9535	1087.1	3.638	1.245
12000	12000	511.23	30.56	-28.44	1.2844	0.6071	2.2583	0.9493	1084.4	3.629	1.242
13000	13000	508.86	28.19	-30.81	1.2270	0.5799	2.2487	0.9451	1081.7	3.620	1.239
14000	14000	506.49	25.82	-33.18	1.1714	0.5536	2.2391	0.9410	1079.0	3.611	1.236
15000	15000	504.12	23.45	-35.55	1.1174	0.5281	2.2295	0.9368	1076.3	3.602	1.233
16000	16000	501.75	21.08	-37.92	1.0650	0.5034	2.2200	0.9327	1073.6	3.593	1.230
17000	17000	499.38	18.71	-40.29	1.0142	0.4794	2.2105	0.9285	1070.9	3.584	1.227
18000	18000	497.01	16.34	-42.66	0.9649	0.4562	2.2010	0.9244	1068.2	3.575	1.224
19000	19000	494.64	13.97	-45.03	0.9171	0.4336	2.1916	0.9203	1065.5	3.566	1.221
20000	20000	492.27	11.60	-47.40	0.8708	0.4117	2.1822	0.9162	1062.8	3.557	1.218
21000	21000	489.90	9.23	-49.77	0.8259	0.3905	2.1728	0.9121	1060.1	3.548	1.215
22000	22000	487.53	6.86	-52.14	0.7824	0.3699	2.1634	0.9080	1057.4	3.539	1.212
23000	23000	485.16	4.49	-54.51	0.7403	0.3500	2.1541	0.9039	1054.7	3.530	1.209
24000	24000	482.79	2.12	-56.88	0.6995	0.3307	2.1448	0.8998	1051.9	3.521	1.206
25000	25000	480.42	-0.25	-59.25	0.6600	0.3120	2.1355	0.8957	1049.2	3.512	1.203
26000	26000	478.05	-2.62	-61.62	0.6218	0.2939	2.1263	0.8916	1046.5	3.503	1.200
27000	27000	475.68	-4.99	-63.99	0.5848	0.2764	2.1170	0.8876	1043.8	3.494	1.197
28000	28000	473.31	-7.36	-66.36	0.5491	0.2595	2.1078	0.8835	1041.0	3.485	1.194
29000	29000	470.94	-9.73	-68.73	0.5146	0.2432	2.0986	0.8794	1038.3	3.476	1.191
30000	30000	468.57	-12.10	-71.10	0.4813	0.2275	2.0895	0.8754	1035.6	3.467	1.188
31000	31000	466.20	-14.47	-73.47	0.4491	0.2123	2.0803	0.8713	1032.8	3.458	1.185
32000	32000	463.83	-16.84	-75.84	0.4181	0.1976	2.0712	0.8673	1030.1	3.449	1.182
33000	33000	461.46	-19.21	-78.21	0.3882	0.1835	2.0621	0.8633	1027.4	3.440	1.179
34000	34000	459.09	-21.58	-80.58	0.3594	0.1699	2.0530	0.8593	1024.6	3.431	1.176
35000	35000	456.72	-23.95	-82.95	0.3316	0.1567	2.0440	0.8553	1021.9	3.422	1.173
36000	36000	454.35	-26.32	-85.32	0.3048	0.1441	2.0349	0.8513	1019.1	3.413	1.170
37000	37000	451.98	-28.69	-87.69	0.2791	0.1319	2.0259	0.8473	1016.4	3.404	1.167
38000	38000	449.61	-31.06	-90.06	0.2543	0.1202	2.0169	0.8433	1013.6	3.395	1.164
39000	39000	447.24	-33.43	-92.43	0.2305	0.1089	2.0079	0.8393	1010.9	3.386	1.161
40000	40000	444.87	-35.80	-94.80	0.2077	0.0982	1.9990	0.8354	1008.1	3.377	1.158
41000	41000	442.50	-38.17	-97.17	0.1858	0.0878	1.9900	0.8314	1005.4	3.368	1.155
42000	42000	440.13	-40.54	-99.54	0.1648	0.0779	1.9811	0.8274	1002.6	3.359	1.152
43000	43000	437.76	-42.91	-101.91	0.1447	0.0684	1.9722	0.8235	999.9	3.350	1.149
44000	44000	435.39	-45.28	-104.28	0.1255	0.0593	1.9633	0.8195	997.1	3.341	1.146
45000	45000	433.02	-47.65	-106.65	0.1071	0.0506	1.9544	0.8156	994.4	3.332	1.143
46000	46000	430.65	-50.02	-109.02	0.0895	0.0423	1.9455	0.8116	991.6	3.323	1.140
47000	47000	428.28	-52.39	-111.39	0.0728	0.0344	1.9367	0.8077	988.8	3.314	1.137
48000	48000	425.91	-54.76	-113.76	0.0568	0.0268	1.9278	0.8038	986.1	3.305	1.134
49000	49000	423.54	-57.13	-116.13	0.0416	0.0197	1.9190	0.7998	983.3	3.296	1.131
50000	50000	421.17	-59.50	-118.50	0.0271	0.0128	1.9102	0.7959	980.5	3.287	1.128
51000	51000	418.80	-61.87	-120.87	0.0134	0.0063	1.9014	0.7920	977.8	3.278	1.125
52000	52000	416.43	-64.24	-123.24	0.0004	0.0002	1.8926	0.7881	975.0	3.269	1.122
53000	53000	414.06	-66.61	-125.61	0.0000	0.0000	1.8838	0.7842	972.2	3.260	1.119
54000	54000	411.69	-68.98	-127.98	0.0000	0.0000	1.8751	0.7803	969.5	3.251	1.116
55000	55000	409.32	-71.35	-130.35	0.0000	0.0000	1.8663	0.7764	966.7	3.242	1.113
56000	56000	406.95	-73.72	-132.72	0.0000	0.0000	1.8576	0.7725	963.9	3.233	1.110
57000	57000	404.58	-76.09	-135.09	0.0000	0.0000	1.8489	0.7686	961.1	3.224	1.107
58000	58000	402.21	-78.46	-137.46	0.0000	0.0000	1.8402	0.7647	958.3	3.215	1.104
59000	59000	399.84	-80.83	-139.83	0.0000	0.0000	1.8315	0.7608	955.5	3.206	1.101
60000	60000	397.47	-83.20	-142.20	0.0000	0.0000	1.8228	0.7570	952.7	3.197	1.098
61000	61000	395.10	-85.57	-144.57	0.0000	0.0000	1.8142	0.7531	949.9	3.188	1.095
62000	62000	392.73	-87.94	-146.94	0.0000	0.0000	1.8055	0.7493	947.1	3.179	1.092
63000	63000	390.36	-90.31	-149.31	0.0000	0.0000	1.7969	0.7455	944.3	3.170	1.089
64000	64000	387.99	-92.68	-151.68	0.0000	0.0000	1.7883	0.7417	941.5	3.161	1.086
65000	65000	385.62	-95.05	-154.05	0.0000	0.0000	1.7797	0.7379	938.7	3.152	1.083
66000	66000	383.25	-97.42	-156.42	0.0000	0.0000	1.7711	0.7341	935.9	3.143	1.080
67000	67000	380.88	-99.79	-158.79	0.0000	0.0000	1.7626	0.7303	933.1	3.134	1.077
68000	68000	378.51	-102.16	-161.16	0.0000	0.0000	1.7540	0.7265	930.3	3.125	1.074
69000	69000	376.14	-104.53	-163.53	0.0000	0.0000	1.7455	0.7228	927.5	3.116	1.071
70000	70000	373.77	-106.90	-165.90	0.0000	0.0000	1.7370	0.7190	924.7	3.107	1.068
71000	71000	371.40	-109.27	-168.27	0.0000	0.0000	1.7285	0.7153	921.9	3.098	1.065
72000	72000	369.03	-111.64	-170.64	0.0000	0.0000	1.7200	0.7115	919.1	3.089	1.062
73000	73000	366.66	-114.01	-173.01	0.0000	0.0000	1.7115	0.7078	916.3	3.080	1.059
74000	74000	364.29	-116.38	-175.38	0.0000	0.0000	1.7031	0.7041	913.5	3.071	1.056
75000	75000	361.92	-118.75	-177.75	0.0000	0.0000	1.6946	0.7004	910.7	3.062	1.053
76000	76000	359.55	-121.12	-180.12	0.0000	0.0000	1.6862	0.6967	907.9	3.053	1.050
77000	77000	357.18	-123.49	-182.49	0.0000	0.0000	1.6778	0.6930	905.1	3.044	1.047
78000	78000	354.81	-125.86	-184.86	0.0000	0.0000	1.6694	0.6893	902.3	3.035	1.044
79000	79000	352.44	-128.23	-187.23	0.0000	0.0000	1.6610	0.6856	899.5	3.026	1.041
80000	80000	350.07	-130.60	-189.60	0.0000	0.0000	1.6526	0.6819	896.7	3.017	1.038

TABLE 5.2 – Continued

[illegible]

COMPUTER TRIAL ALGORITHM, UNITARY UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Geopotential altitude	Molecular weight ratio
z, km	h, km	T, K	t, °C	$T - T_{sl}$, K	P, mb	$\frac{P}{P_{sl}}$	ρ, kg/m³	$\frac{\rho}{\rho_{sl}}$	a, m/s	h, km	$\frac{M}{M_0}$
0	0	288.15	15.00	0.00	1013.25	1.0000	1.2250	1.0000	340.29	0.000	1.0000
0.500	0.500	284.90	11.75	-3.25	954.61	0.9421	1.1673	0.9529	338.37	0.500	1.0000
1.000	1.000	281.65	8.50	-6.50	898.76	0.8870	1.1117	0.9075	336.43	1.000	1.0000
1.500	1.499	278.40	5.25	-9.75	845.60	0.8345	1.0581	0.8638	334.48	1.499	1.0000
2.000	1.999	275.15	2.00	-13.00	795.01	0.7846	1.0066	0.8217	332.52	1.999	1.0000
2.500	2.498	271.90	-1.25	-16.25	746.86	0.7372	0.9569	0.7812	330.54	2.498	1.0000
3.000	2.997	268.65	-4.50	-19.50	701.04	0.6920	0.9092	0.7423	328.55	2.997	1.0000
3.500	3.496	265.40	-7.75	-22.75	657.45	0.6490	0.8633	0.7048	326.55	3.496	1.0000
4.000	3.995	262.15	-11.00	-26.00	615.97	0.6081	0.8191	0.6689	324.53	3.995	1.0000
4.500	4.493	258.90	-14.25	-29.25	576.52	0.5691	0.7767	0.6343	322.49	4.493	1.0000
5.000	4.992	255.65	-17.50	-32.50	539.00	0.5321	0.7360	0.6010	320.45	4.992	1.0000
5.500	5.490	252.40	-20.75	-35.75	503.32	0.4969	0.6969	0.5690	318.38	5.490	1.0000
6.000	5.988	249.15	-24.00	-39.00	469.38	0.4634	0.6594	0.5383	316.30	5.988	1.0000
6.500	6.486	245.90	-27.25	-42.25	437.09	0.4316	0.6234	0.5089	314.20	6.486	1.0000
7.000	6.984	242.65	-30.50	-45.50	406.37	0.4013	0.5889	0.4808	312.08	6.984	1.0000
7.500	7.482	239.40	-33.75	-48.75	377.14	0.3724	0.5558	0.4538	309.93	7.482	1.0000
8.000	7.979	236.15	-37.00	-52.00	349.32	0.3449	0.5241	0.4280	307.77	7.979	1.0000
8.500	8.476	232.90	-40.25	-55.25	322.84	0.3187	0.4937	0.4032	305.58	8.476	1.0000
9.000	8.973	229.65	-43.50	-58.50	297.63	0.2938	0.4646	0.3794	303.37	8.973	1.0000
9.500	9.470	226.40	-46.75	-61.75	273.62	0.2701	0.4368	0.3566	301.13	9.470	1.0000
10.000	9.966	223.15	-50.00	-65.00	250.75	0.2476	0.4102	0.3349	298.87	9.966	1.0000
10.500	10.462	219.90	-53.25	-68.25	228.96	0.2260	0.3847	0.3141	296.58	10.462	1.0000
11.000	10.958	216.65	-56.50	-71.50	208.19	0.2055	0.3603	0.2942	294.26	10.958	1.0000
11.500	11.453	216.65	-56.50	-71.50	189.33	0.1869	0.3277	0.2676	294.26	11.453	1.0000
12.000	11.947	216.65	-56.50	-71.50	172.16	0.1700	0.2980	0.2433	294.26	11.947	1.0000
12.500	12.441	216.65	-56.50	-71.50	156.52	0.1545	0.2709	0.2212	294.26	12.441	1.0000
13.000	12.935	216.65	-56.50	-71.50	142.31	0.1405	0.2463	0.2011	294.26	12.935	1.0000
13.500	13.428	216.65	-56.50	-71.50	129.40	0.1277	0.2240	0.1829	294.26	13.428	1.0000
14.000	13.921	216.65	-56.50	-71.50	117.68	0.1162	0.2037	0.1663	294.26	13.921	1.0000
14.500	14.414	216.65	-56.50	-71.50	107.02	0.1057	0.1853	0.1512	294.26	14.414	1.0000
15.000	14.906	216.65	-56.50	-71.50	97.33	0.0961	0.1685	0.1376	294.26	14.906	1.0000
15.500	15.398	216.65	-56.50	-71.50	88.52	0.0874	0.1533	0.1251	294.26	15.398	1.0000
16.000	15.890	216.65	-56.50	-71.50	80.51	0.0795	0.1394	0.1138	294.26	15.890	1.0000
16.500	16.381	216.65	-56.50	-71.50	73.24	0.0723	0.1268	0.1035	294.26	16.381	1.0000
17.000	16.872	216.65	-56.50	-71.50	66.61	0.0658	0.1153	0.0941	294.26	16.872	1.0000
17.500	17.363	216.65	-56.50	-71.50	60.58	0.0598	0.1049	0.0856	294.26	17.363	1.0000
18.000	17.853	216.65	-56.50	-71.50	55.09	0.0544	0.0954	0.0779	294.26	17.853	1.0000
18.500	18.343	216.65	-56.50	-71.50	50.09	0.0495	0.0868	0.0708	294.26	18.343	1.0000
19.000	18.833	216.65	-56.50	-71.50	45.55	0.0450	0.0789	0.0644	294.26	18.833	1.0000
19.500	19.322	216.65	-56.50	-71.50	41.42	0.0409	0.0718	0.0586	294.26	19.322	1.0000
20.000	19.811	216.65	-56.50	-71.50	37.66	0.0372	0.0653	0.0533	294.26	19.811	1.0000
20.500	20.300	216.65	-56.50	-71.50	34.24	0.0338	0.0594	0.0485	294.26	20.300	1.0000
21.000	20.788	216.65	-56.50	-71.50	31.14	0.0307	0.0540	0.0441	294.26	20.788	1.0000
21.500	21.276	216.65	-56.50	-71.50	28.32	0.0280	0.0491	0.0401	294.26	21.276	1.0000
22.000	21.764	216.65	-56.50	-71.50	25.75	0.0254	0.0447	0.0365	294.26	21.764	1.0000
22.500	22.251	216.65	-56.50	-71.50	23.42	0.0231	0.0406	0.0332	294.26	22.251	1.0000
23.000	22.738	216.65	-56.50	-71.50	21.29	0.0210	0.0370	0.0302	294.26	22.738	1.0000
23.500	23.224	216.65	-56.50	-71.50	19.36	0.0191	0.0336	0.0275	294.26	23.224	1.0000
24.000	23.710	216.65	-56.50	-71.50	17.61	0.0174	0.0306	0.0250	294.26	23.710	1.0000
24.500	24.196	216.65	-56.50	-71.50	16.01	0.0158	0.0278	0.0227	294.26	24.196	1.0000
25.000	24.681	216.65	-56.50	-71.50	14.56	0.0144	0.0253	0.0207	294.26	24.681	1.0000
25.500	25.166	216.65	-56.50	-71.50	13.24	0.0131	0.0230	0.0188	294.26	25.166	1.0000
26.000	25.650	216.65	-56.50	-71.50	12.04	0.0119	0.0209	0.0171	294.26	25.650	1.0000
26.500	26.134	216.65	-56.50	-71.50	10.95	0.0108	0.0190	0.0156	294.26	26.134	1.0000
27.000	26.618	216.65	-56.50	-71.50	9.96	0.0098	0.0173	0.0141	294.26	26.618	1.0000
27.500	27.102	216.65	-56.50	-71.50	9.06	0.0089	0.0157	0.0128	294.26	27.102	1.0000
28.000	27.585	216.65	-56.50	-71.50	8.24	0.0081	0.0143	0.0117	294.26	27.585	1.0000
28.500	28.067	216.65	-56.50	-71.50	7.49	0.0074	0.0130	0.0106	294.26	28.067	1.0000
29.000	28.549	216.65	-56.50	-71.50	6.82	0.0067	0.0118	0.0096	294.26	28.549	1.0000
29.500	29.031	216.65	-56.50	-71.50	6.20	0.0061	0.0107	0.0087	294.26	29.031	1.0000
30.000	29.513	216.65	-56.50	-71.50	5.65	0.0056	0.0097	0.0079	294.26	29.513	1.0000

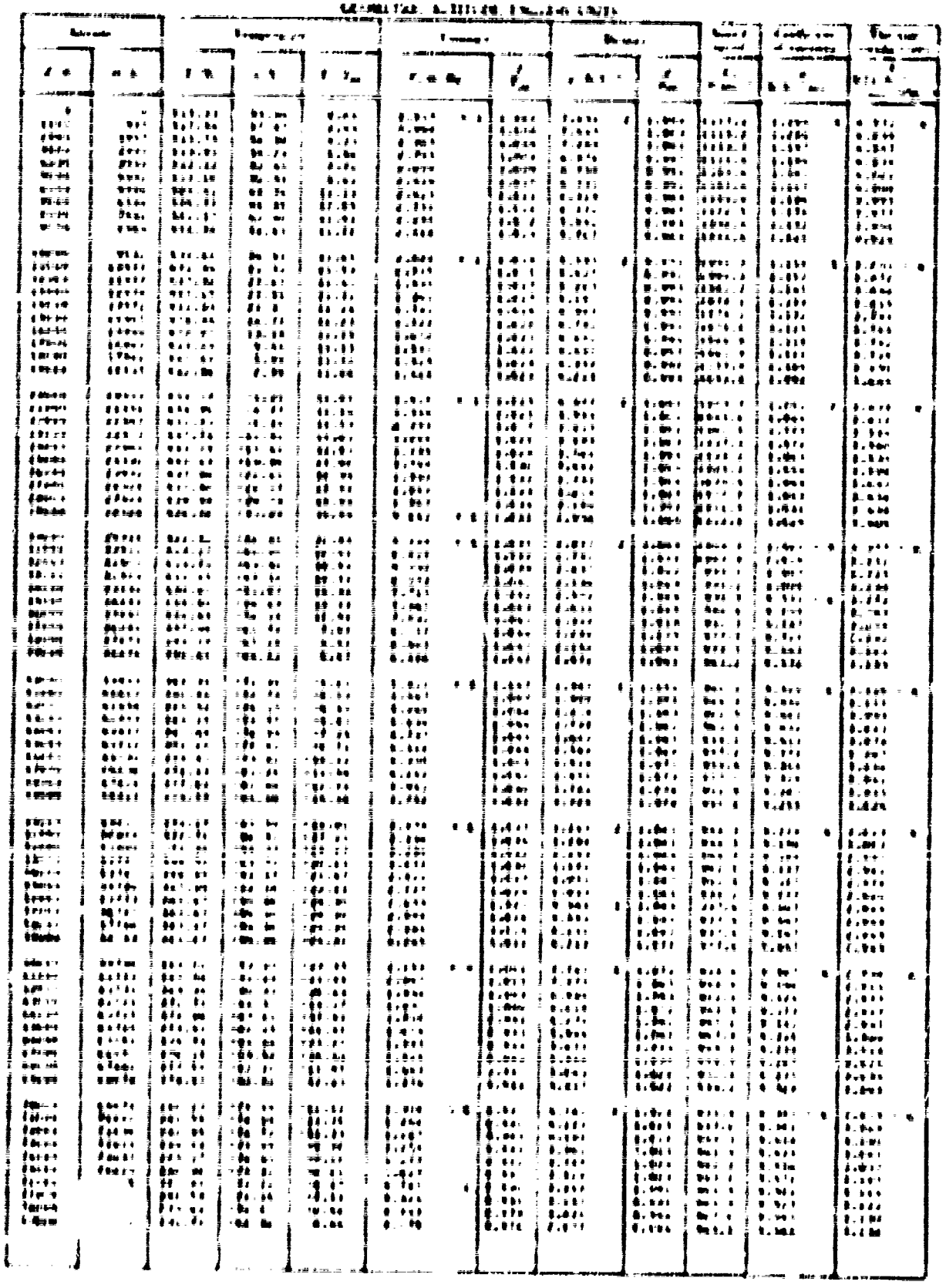

TABLE [illegible] — Continued

GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
H, ft	Z, ft	T, °R	t, °F	[illegible]	P, in. Hg	P/P₀	ρ	ρ/ρ₀	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 5.2 – Continued
30° N January
GEOMETRIC ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, ft	H, ft	T, °R	t, °F	T − T_m	P, in. Hg	P/P_m	ρ, lb ft^-3	ρ/ρ_m	C_s, ft sec^-1	μ, lb ft^-1 sec^-1	k, BTU ft^-1 sec^-1 °R^-1
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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TABLE 5.2 – Continued

[illegible] Jan

[illegible] ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Speed of sound	Acceleration of gravity	Viscosity coefficient
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0	0	548.69	88.52	59.16	2.1161	1.0000	2.3769	1.0000	1116.8	1.0000	3.7373
1000	1000	543.51	83.34	58.21	2.0429	0.9654	2.3506	0.9889	1113.9	1.0000	3.7294
2000	2000	538.37	78.20	58.03	1.9709	0.9314	2.3244	0.9779	1111.1	1.0000	3.7215
3000	3000	533.18	73.01	57.85	1.9007	0.8983	2.2981	0.9668	1108.2	1.0000	3.7136
4000	4000	527.99	67.82	57.67	1.8324	0.8659	2.2719	0.9557	1105.3	1.0000	3.7057
5000	5000	522.84	62.67	57.49	1.7658	0.8344	2.2456	0.9446	1102.4	1.0000	3.6978
6000	6000	517.65	57.48	57.31	1.7010	0.8037	2.2194	0.9335	1099.5	1.0000	3.6899
7000	7000	512.46	52.29	57.13	1.6379	0.7738	2.1931	0.9224	1096.6	1.0000	3.6820
8000	8000	507.31	47.14	56.95	1.5765	0.7447	2.1669	0.9113	1093.7	1.0000	3.6741
9000	9000	502.12	41.95	56.77	1.5168	0.7165	2.1406	0.9002	1090.8	1.0000	3.6662
10000	10000	496.93	36.76	56.59	1.4587	0.6890	2.1144	0.8891	1087.9	1.0000	3.6583
11000	11000	491.78	31.61	56.41	1.4022	0.6624	2.0881	0.8780	1085.0	1.0000	3.6504
12000	12000	486.59	26.42	56.23	1.3473	0.6365	2.0619	0.8669	1082.1	1.0000	3.6425
13000	13000	481.40	21.23	56.05	1.2940	0.6113	2.0356	0.8558	1079.2	1.0000	3.6346
14000	14000	476.25	16.08	55.87	1.2422	0.5868	2.0094	0.8447	1076.3	1.0000	3.6267
15000	15000	471.06	10.89	55.69	1.1920	0.5631	1.9831	0.8336	1073.4	1.0000	3.6188
16000	16000	465.87	5.70	55.51	1.1432	0.5400	1.9569	0.8225	1070.5	1.0000	3.6109
17000	17000	460.72	0.55	55.33	1.0959	0.5176	1.9306	0.8114	1067.6	1.0000	3.6030
18000	18000	455.53	-4.64	55.15	1.0501	0.4960	1.9044	0.8003	1064.7	1.0000	3.5951
19000	19000	450.34	-9.83	54.97	1.0057	0.4750	1.8781	0.7892	1061.8	1.0000	3.5872
20000	20000	445.19	-14.98	54.79	0.9627	0.4547	1.8519	0.7781	1058.9	1.0000	3.5793
21000	21000	440.00	-20.17	54.61	0.9211	0.4350	1.8256	0.7670	1056.0	1.0000	3.5714
22000	22000	434.81	-25.36	54.43	0.8808	0.4160	1.7994	0.7559	1053.1	1.0000	3.5635
23000	23000	429.66	-30.51	54.25	0.8418	0.3976	1.7731	0.7448	1050.2	1.0000	3.5556
24000	24000	424.47	-35.70	54.07	0.8041	0.3797	1.7469	0.7337	1047.3	1.0000	3.5477
25000	25000	419.28	-40.89	53.89	0.7677	0.3625	1.7206	0.7226	1044.4	1.0000	3.5398
26000	26000	414.13	-46.04	53.71	0.7325	0.3459	1.6944	0.7115	1041.5	1.0000	3.5319
27000	27000	408.94	-51.23	53.53	0.6986	0.3299	1.6681	0.7004	1038.6	1.0000	3.5240
28000	28000	403.75	-56.42	53.35	0.6658	0.3144	1.6419	0.6893	1035.7	1.0000	3.5161
29000	29000	398.60	-61.57	53.17	0.6342	0.2995	1.6156	0.6782	1032.8	1.0000	3.5082
30000	30000	393.41	-66.76	52.99	0.6037	0.2851	1.5894	0.6671	1029.9	1.0000	3.5003
31000	31000	388.22	-71.95	52.81	0.5743	0.2712	1.5631	0.6560	1027.0	1.0000	3.4924
32000	32000	383.07	-77.10	52.63	0.5460	0.2578	1.5369	0.6449	1024.1	1.0000	3.4845
33000	33000	377.88	-82.29	52.45	0.5188	0.2450	1.5106	0.6338	1021.2	1.0000	3.4766
34000	34000	372.69	-87.48	52.27	0.4926	0.2326	1.4844	0.6227	1018.3	1.0000	3.4687
35000	35000	367.54	-92.63	52.09	0.4675	0.2207	1.4581	0.6116	1015.4	1.0000	3.4608
36000	36000	362.35	-97.82	51.91	0.4435	0.2094	1.4319	0.6005	1012.5	1.0000	3.4529
37000	37000	357.16	-103.01	51.73	0.4205	0.1985	1.4056	0.5894	1009.6	1.0000	3.4450
38000	38000	352.01	-108.16	51.55	0.3985	0.1882	1.3794	0.5783	1006.7	1.0000	3.4371
39000	39000	346.82	-113.35	51.37	0.3776	0.1783	1.3531	0.5672	1003.8	1.0000	3.4292
40000	40000	341.63	-118.54	51.19	0.3577	0.1689	1.3269	0.5561	1000.9	1.0000	3.4213
41000	41000	336.48	-123.69	51.01	0.3388	0.1600	1.3006	0.5450	998.0	1.0000	3.4134
42000	42000	331.29	-128.88	50.83	0.3209	0.1515	1.2744	0.5339	995.1	1.0000	3.4055
43000	43000	326.10	-134.07	50.65	0.3039	0.1435	1.2481	0.5228	992.2	1.0000	3.3976
44000	44000	320.91	-139.26	50.47	0.2878	0.1359	1.2219	0.5117	989.3	1.0000	3.3897
45000	45000	315.76	-144.41	50.29	0.2726	0.1287	1.1956	0.5006	986.4	1.0000	3.3818
46000	46000	310.57	-149.60	50.11	0.2582	0.1219	1.1694	0.4895	983.5	1.0000	3.3739
47000	47000	305.38	-154.79	49.93	0.2446	0.1155	1.1431	0.4784	980.6	1.0000	3.3660
48000	48000	300.19	-159.98	49.75	0.2318	0.1094	1.1169	0.4673	977.7	1.0000	3.3581
49000	49000	295.04	-165.13	49.57	0.2197	0.1037	1.0906	0.4562	974.8	1.0000	3.3502
50000	50000	289.85	-170.32	49.39	0.2082	0.0983	1.0644	0.4451	971.9	1.0000	3.3423
51000	51000	284.66	-175.51	49.21	0.1974	0.0932	1.0381	0.4340	969.0	1.0000	3.3344
52000	52000	279.51	-180.66	49.03	0.1872	0.0884	1.0119	0.4229	966.1	1.0000	3.3265
53000	53000	274.32	-185.85	48.85	0.1775	0.0838	0.9856	0.4118	963.2	1.0000	3.3186
54000	54000	269.13	-191.04	48.67	0.1683	0.0795	0.9594	0.4007	960.3	1.0000	3.3107
55000	55000	263.94	-196.23	48.49	0.1597	0.0754	0.9331	0.3896	957.4	1.0000	3.3028
56000	56000	258.79	-201.38	48.31	0.1515	0.0716	0.9069	0.3785	954.5	1.0000	3.2949
57000	57000	253.60	-206.57	48.13	0.1437	0.0679	0.8806	0.3674	951.6	1.0000	3.2870
58000	58000	248.41	-211.76	47.95	0.1364	0.0644	0.8544	0.3563	948.7	1.0000	3.2791
59000	59000	243.22	-216.95	47.77	0.1294	0.0611	0.8281	0.3452	945.8	1.0000	3.2712
60000	60000	238.07	-222.10	47.59	0.1229	0.0581	0.8019	0.3341	942.9	1.0000	3.2633
61000	61000	232.88	-227.29	47.41	0.1166	0.0551	0.7756	0.3230	940.0	1.0000	3.2554
62000	62000	227.69	-232.48	47.23	0.1107	0.0523	0.7494	0.3119	937.1	1.0000	3.2475
63000	63000	222.50	-237.67	47.05	0.1050	0.0496	0.7231	0.3008	934.2	1.0000	3.2396
64000	64000	217.35	-242.82	46.87	0.0997	0.0471	0.6969	0.2897	931.3	1.0000	3.2317
65000	65000	212.16	-248.01	46.69	0.0946	0.0447	0.6706	0.2786	928.4	1.0000	3.2238
66000	66000	206.97	-253.20	46.51	0.0898	0.0424	0.6444	0.2675	925.5	1.0000	3.2159
67000	67000	201.78	-258.39	46.33	0.0852	0.0403	0.6181	0.2564	922.6	1.0000	3.2080
68000	68000	196.63	-263.54	46.15	0.0809	0.0382	0.5919	0.2453	919.7	1.0000	3.2001
69000	69000	191.44	-268.73	45.97	0.0767	0.0363	0.5656	0.2342	916.8	1.0000	3.1922
70000	70000	186.25	-273.92	45.79	0.0728	0.0344	0.5394	0.2231	913.9	1.0000	3.1843
71000	71000	181.06	-279.11	45.61	0.0691	0.0327	0.5131	0.2120	911.0	1.0000	3.1764
72000	72000	175.91	-284.26	45.43	0.0655	0.0310	0.4869	0.2009	908.1	1.0000	3.1685
73000	73000	170.72	-289.45	45.25	0.0622	0.0294	0.4606	0.1898	905.2	1.0000	3.1606
74000	74000	165.53	-294.64	45.07	0.0590	0.0279	0.4344	0.1787	902.3	1.0000	3.1527
75000	75000	160.34	-299.83	44.89	0.0560	0.0265	0.4081	0.1676	899.4	1.0000	3.1448
76000	76000	155.19	-304.98	44.71	0.0531	0.0251	0.3819	0.1565	896.5	1.0000	3.1369
77000	77000	150.00	-310.17	44.53	0.0504	0.0238	0.3556	0.1454	893.6	1.0000	3.1290
78000	78000	144.81	-315.36	44.35	0.0478	0.0226	0.3294	0.1343	890.7	1.0000	3.1211
79000	79000	139.62	-320.55	44.17	0.0453	0.0214	0.3031	0.1232	887.8	1.0000	3.1132
80000	80000	134.47	-325.70	43.99	0.0430	0.0203	0.2769	0.1121	884.9	1.0000	3.1053
81000	81000	129.28	-330.89	43.81	0.0407	0.0192	0.2506	0.1010	882.0	1.0000	3.0974
82000	82000	124.09	-336.08	43.63	0.0386	0.0182	0.2244	0.0899	879.1	1.0000	3.0895
83000	83000	118.90	-341.27	43.45	0.0366	0.0173	0.1981	0.0788	876.2	1.0000	3.0816
84000	84000	113.75	-346.42	43.27	0.0347	0.0164	0.1719	0.0677	873.3	1.0000	3.0737
85000	85000	108.56	-351.61	43.09	0.0329	0.0155	0.1456	0.0566	870.4	1.0000	3.0658
86000	86000	103.37	-356.80	42.91	0.0312	0.0147	0.1194	0.0455	867.5	1.0000	3.0579
87000	87000	98.18	-361.99	42.73	0.0296	0.0140	0.0931	0.0344	864.6	1.0000	3.0500
88000	88000	93.03	-367.14	42.55	0.0281	0.0133	0.0669	0.0233	861.7	1.0000	3.0421
89000	89000	87.84	-372.33	42.37	0.0267	0.0126	0.0406	0.0122	858.8	1.0000	3.0342
90000	90000	82.65	-377.52	42.19	0.0253	0.0120	0.0144	0.0011	855.9	1.0000	3.0263

TABLE 1.2 – Continued

GEOMETRIC ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Speed of sound	Dynamic viscosity	Kinematic viscosity
H	h	T	t	$\theta = \frac{T}{T_{sl}}$	P	$\delta = \frac{P}{P_{sl}}$	ρ	$\sigma = \frac{\rho}{\rho_{sl}}$	a	μ	$\nu = \frac{\mu}{\rho}$
ft	ft	°R	°F		lb/ft²		slug/ft³		ft/s	lb·s/ft²	ft²/s
0	0	518.67	58.98	1.0000	2.1162 × 3	1.0000	2.3769 − 3	1.0000	1116.5	3.7373 − 7	1.5723 − 4
1000	1000	515.50	55.81	0.9941	2.0360	0.9622	2.3668	0.9958	1112.9	3.7316	1.5765
2000	2000	512.34	52.65	0.9883	1.9572	0.9249	2.3567	0.9916	1109.4	3.7259	1.5807
3000	3000	509.17	49.48	0.9824	1.8806	0.8887	2.3466	0.9874	1105.8	3.7202	1.5850
4000	4000	506.01	46.32	0.9766	1.8061	0.8535	2.3365	0.9831	1102.2	3.7145	1.5893
5000	5000	502.84	43.15	0.9707	1.7337	0.8193	2.3264	0.9789	1098.6	3.7088	1.5937
6000	6000	499.68	39.98	0.9648	1.6633	0.7860	2.3164	0.9747	1095.0	3.7031	1.5980
7000	7000	496.51	36.82	0.9590	1.5948	0.7537	2.3063	0.9705	1091.4	3.6974	1.6024
8000	8000	493.35	33.65	0.9531	1.5283	0.7223	2.2962	0.9663	1087.8	3.6917	1.6068
9000	9000	490.18	30.49	0.9473	1.4637	0.6918	2.2862	0.9621	1084.2	3.6860	1.6113
10000	10000	487.02	27.32	0.9414	1.4010	0.6622	2.2762	0.9579	1080.6	3.6803	1.6158
11000	11000	483.85	24.15	0.9355	1.3401	0.6334	2.2661	0.9537	1076.9	3.6745	1.6203
12000	12000	480.69	20.99	0.9297	1.2810	0.6055	2.2561	0.9495	1073.3	3.6688	1.6248
13000	13000	477.52	17.82	0.9238	1.2237	0.5784	2.2461	0.9453	1069.7	3.6631	1.6294
14000	14000	474.36	14.65	0.9180	1.1681	0.5521	2.2361	0.9411	1066.1	3.6573	1.6340
15000	15000	471.19	11.49	0.9121	1.1142	0.5266	2.2261	0.9369	1062.4	3.6516	1.6386
16000	16000	468.03	8.32	0.9062	1.0619	0.5019	2.2161	0.9327	1058.8	3.6458	1.6432
17000	17000	464.86	5.16	0.9004	1.0113	0.4780	2.2061	0.9285	1055.2	3.6401	1.6479
18000	18000	461.69	1.99	0.8945	0.9622	0.4548	2.1961	0.9243	1051.5	3.6343	1.6525
19000	19000	458.53	−1.18	0.8887	0.9147	0.4324	2.1861	0.9201	1047.9	3.6285	1.6572
20000	20000	455.36	−4.35	0.8828	0.8687	0.4107	2.1761	0.9159	1044.2	3.6227	1.6619
21000	21000	452.20	−7.51	0.8770	0.8242	0.3896	2.1662	0.9117	1040.6	3.6169	1.6666
22000	22000	449.03	−10.68	0.8711	0.7811	0.3693	2.1562	0.9075	1036.9	3.6111	1.6713
23000	23000	445.87	−13.84	0.8652	0.7394	0.3496	2.1462	0.9033	1033.2	3.6053	1.6760
24000	24000	442.70	−17.01	0.8594	0.6991	0.3305	2.1363	0.8991	1029.6	3.5995	1.6808
25000	25000	439.54	−20.17	0.8535	0.6601	0.3121	2.1263	0.8949	1025.9	3.5937	1.6856
26000	26000	436.37	−23.34	0.8477	0.6224	0.2943	2.1164	0.8907	1022.2	3.5879	1.6904
27000	27000	433.21	−26.50	0.8418	0.5860	0.2771	2.1064	0.8865	1018.5	3.5821	1.6952
28000	28000	430.04	−29.67	0.8359	0.5508	0.2604	2.0965	0.8823	1014.8	3.5763	1.7000
29000	29000	426.88	−32.83	0.8301	0.5168	0.2443	2.0866	0.8781	1011.1	3.5705	1.7049
30000	30000	423.71	−36.00	0.8242	0.4839	0.2288	2.0767	0.8739	1007.4	3.5647	1.7098
31000	31000	420.55	−39.16	0.8184	0.4522	0.2138	2.0667	0.8697	1003.7	3.5589	1.7147
32000	32000	417.38	−42.33	0.8125	0.4216	0.1993	2.0568	0.8655	1000.0	3.5531	1.7196
33000	33000	414.21	−45.50	0.8066	0.3921	0.1853	2.0469	0.8613	996.3	3.5473	1.7246
34000	34000	411.05	−48.66	0.8008	0.3636	0.1719	2.0370	0.8571	992.6	3.5415	1.7296
35000	35000	407.88	−51.83	0.7949	0.3362	0.1589	2.0271	0.8529	988.9	3.5357	1.7346
36000	36000	404.72	−54.99	0.7891	0.3098	0.1464	2.0172	0.8487	985.2	3.5299	1.7396
37000	37000	401.55	−58.16	0.7832	0.2844	0.1344	2.0073	0.8445	981.5	3.5241	1.7447
38000	38000	398.39	−61.32	0.7773	0.2599	0.1228	1.9974	0.8403	977.8	3.5183	1.7498
39000	39000	395.22	−64.49	0.7715	0.2364	0.1117	1.9875	0.8361	974.1	3.5125	1.7549
40000	40000	392.06	−67.65	0.7656	0.2138	0.1010	1.9777	0.8319	970.4	3.5067	1.7600
41000	41000	388.89	−70.82	0.7598	0.1922	0.0908	1.9678	0.8277	966.7	3.5009	1.7652
42000	42000	385.72	−73.99	0.7539	0.1714	0.0810	1.9579	0.8235	962.9	3.4951	1.7704
43000	43000	382.56	−77.15	0.7480	0.1516	0.0716	1.9481	0.8193	959.2	3.4893	1.7756
44000	44000	379.39	−80.32	0.7422	0.1326	0.0626	1.9382	0.8151	955.5	3.4835	1.7808
45000	45000	376.23	−83.48	0.7363	0.1145	0.0541	1.9284	0.8109	951.8	3.4777	1.7861
46000	46000	373.06	−86.65	0.7305	0.0972	0.0459	1.9186	0.8067	948.0	3.4719	1.7914
47000	47000	369.90	−89.81	0.7246	0.0807	0.0381	1.9088	0.8025	944.3	3.4661	1.7967
48000	48000	366.73	−92.98	0.7187	0.0650	0.0307	1.8990	0.7983	940.6	3.4603	1.8020
49000	49000	363.57	−96.14	0.7129	0.0501	0.0237	1.8892	0.7941	936.8	3.4545	1.8073
50000	50000	360.40	−99.31	0.7070	0.0360	0.0170	1.8794	0.7899	933.1	3.4487	1.8127
51000	51000	357.24	−102.47	0.7012	0.0226	0.0107	1.8696	0.7857	929.3	3.4429	1.8181
52000	52000	354.07	−105.64	0.6953	0.0100	0.0047	1.8599	0.7815	925.6	3.4371	1.8235
53000	53000	350.90	−108.81	0.6895	0.0019	0.0009	1.8501	0.7773	921.8	3.4313	1.8289
54000	54000	347.74	−111.97	0.6836	0.0013	0.0006	1.8404	0.7731	918.1	3.4255	1.8344
55000	55000	344.57	−115.14	0.6777	0.0008	0.0004	1.8307	0.7689	914.3	3.4197	1.8399
56000	56000	341.41	−118.30	0.6719	0.0005	0.0002	1.8210	0.7647	910.5	3.4139	1.8454
57000	57000	338.24	−121.47	0.6660	0.0003	0.0001	1.8113	0.7605	906.8	3.4081	1.8509
58000	58000	335.08	−124.63	0.6602	0.0002	0.0001	1.8016	0.7563	903.0	3.4023	1.8564
59000	59000	331.91	−127.80	0.6543	0.0001	0.0000	1.7919	0.7521	899.2	3.3965	1.8620
60000	60000	328.74	−130.97	0.6484	0.0001	0.0000	1.7822	0.7479	895.4	3.3907	1.8676

TABLE 3.2 – Continued

SI UNITS

COMPONENT AIR PROPERTIES, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
H, ft	Z, ft	T, °R	t, °F	$T - T_{std}$, °R	p, lb/ft²	$\frac{p}{p_{sl}}$	ρ, slug/ft³	$\frac{\rho}{\rho_{sl}}$	a, ft/sec	μ, lb-sec/ft²	k, Btu/ft-sec-°R
0	0	518.67	59.00	0.00	2116.2	1.000	0.002377	1.000	1116.4	3.737×10^{-7}	1.279×10^{-8}
1000	1000	515.50	55.43	0.36	2040.9	0.9644	0.002308	0.9711	1112.7	3.717×10^{-7}	1.272×10^{-8}
2000	2000	512.33	51.87	0.73	1967.7	0.9298	0.002241	0.9428	1108.9	3.697×10^{-7}	1.265×10^{-8}
3000	3000	509.17	48.30	1.09	1896.7	0.8962	0.002175	0.9151	1105.1	3.677×10^{-7}	1.258×10^{-8}
4000	4000	506.00	44.73	1.46	1827.8	0.8637	0.002111	0.8881	1101.3	3.657×10^{-7}	1.251×10^{-8}
5000	5000	502.83	41.17	1.83	1761.0	0.8320	0.002048	0.8617	1097.5	3.637×10^{-7}	1.244×10^{-8}
6000	6000	499.67	37.60	2.19	1696.2	0.8014	0.001987	0.8359	1093.7	3.617×10^{-7}	1.237×10^{-8}
7000	7000	496.50	34.03	2.56	1633.4	0.7717	0.001927	0.8108	1089.8	3.597×10^{-7}	1.230×10^{-8}
8000	8000	493.33	30.47	2.93	1572.5	0.7430	0.001868	0.7862	1086.0	3.577×10^{-7}	1.223×10^{-8}
9000	9000	490.17	26.90	3.29	1513.5	0.7151	0.001811	0.7623	1082.2	3.557×10^{-7}	1.216×10^{-8}
10000	10000	487.00	23.33	3.66	1456.4	0.6882	0.001756	0.7388	1078.4	3.537×10^{-7}	1.209×10^{-8}
11000	10999	483.84	19.77	4.02	1401.1	0.6620	0.001702	0.7160	1074.5	3.517×10^{-7}	1.202×10^{-8}
12000	11999	480.67	16.20	4.39	1347.6	0.6367	0.001649	0.6937	1070.7	3.497×10^{-7}	1.195×10^{-8}
13000	12999	477.50	12.63	4.76	1295.8	0.6122	0.001598	0.6720	1066.9	3.477×10^{-7}	1.188×10^{-8}
14000	13999	474.34	9.07	5.12	1245.7	0.5886	0.001548	0.6509	1063.0	3.457×10^{-7}	1.181×10^{-8}
15000	14999	471.17	5.50	5.49	1197.2	0.5656	0.001499	0.6303	1059.2	3.437×10^{-7}	1.174×10^{-8}
16000	15999	468.00	1.93	5.86	1150.4	0.5435	0.001452	0.6102	1055.4	3.417×10^{-7}	1.167×10^{-8}
17000	16999	464.84	-1.63	6.22	1105.1	0.5221	0.001406	0.5907	1051.5	3.397×10^{-7}	1.160×10^{-8}
18000	17999	461.67	-5.20	6.59	1061.4	0.5014	0.001361	0.5717	1047.7	3.377×10^{-7}	1.153×10^{-8}
19000	18999	458.50	-8.77	6.96	1019.3	0.4815	0.001317	0.5532	1043.8	3.357×10^{-7}	1.146×10^{-8}
20000	19999	455.34	-12.33	7.32	978.7	0.4623	0.001275	0.5352	1039.9	3.337×10^{-7}	1.139×10^{-8}
21000	20998	452.17	-15.90	7.69	939.7	0.4438	0.001233	0.5178	1036.1	3.317×10^{-7}	1.132×10^{-8}
22000	21998	449.00	-19.47	8.06	902.1	0.4260	0.001193	0.5008	1032.2	3.297×10^{-7}	1.125×10^{-8}
23000	22998	445.84	-23.03	8.42	865.9	0.4089	0.001153	0.4843	1028.3	3.277×10^{-7}	1.118×10^{-8}
24000	23998	442.67	-26.60	8.79	831.2	0.3925	0.001115	0.4683	1024.4	3.257×10^{-7}	1.111×10^{-8}
25000	24998	439.50	-30.17	9.16	797.8	0.3767	0.001078	0.4527	1020.5	3.237×10^{-7}	1.104×10^{-8}
26000	25998	436.34	-33.73	9.52	765.8	0.3616	0.001042	0.4376	1016.6	3.217×10^{-7}	1.097×10^{-8}
27000	26998	433.17	-37.30	9.89	735.1	0.3471	0.001007	0.4229	1012.7	3.197×10^{-7}	1.090×10^{-8}
28000	27998	430.00	-40.87	10.26	705.7	0.3332	0.0009727	0.4087	1008.8	3.177×10^{-7}	1.083×10^{-8}
29000	28998	426.84	-44.43	10.62	677.6	0.3199	0.0009394	0.3949	1004.8	3.157×10^{-7}	1.076×10^{-8}
30000	29997	423.67	-48.00	10.99	650.7	0.3072	0.0009071	0.3815	1000.9	3.137×10^{-7}	1.069×10^{-8}
31000	30997	420.50	-51.57	11.36	625.0	0.2951	0.0008756	0.3685	996.9	3.117×10^{-7}	1.062×10^{-8}
32000	31997	417.34	-55.13	11.72	600.5	0.2835	0.0008452	0.3559	993.0	3.097×10^{-7}	1.055×10^{-8}
33000	32997	414.17	-58.70	12.09	577.2	0.2725	0.0008156	0.3436	989.0	3.077×10^{-7}	1.048×10^{-8}
34000	33997	411.00	-62.27	12.46	554.9	0.2620	0.0007870	0.3312	985.0	3.057×10^{-7}	1.041×10^{-8}
35000	34997	407.84	-65.83	12.82	533.8	0.2520	0.0007592	0.3196	981.0	3.037×10^{-7}	1.034×10^{-8}
36000	35996	404.67	-69.40	13.19	513.7	0.2425	0.0007323	0.3082	977.0	3.017×10^{-7}	1.027×10^{-8}
37000	36996	401.50	-72.97	13.56	494.6	0.2335	0.0007062	0.2972	973.0	2.997×10^{-7}	1.020×10^{-8}
38000	37996	398.34	-76.53	13.92	476.5	0.2250	0.0006809	0.2866	969.0	2.977×10^{-7}	1.013×10^{-8}
39000	38996	395.17	-80.10	14.29	459.3	0.2168	0.0006564	0.2763	965.0	2.957×10^{-7}	1.006×10^{-8}
40000	39996	392.00	-83.67	14.66	443.1	0.2092	0.0006327	0.2663	961.0	2.937×10^{-7}	9.989×10^{-9}
41000	40995	388.84	-87.23	15.02	427.7	0.2019	0.0006097	0.2567	956.9	2.917×10^{-7}	9.918×10^{-9}
42000	41995	385.67	-90.80	15.39	413.2	0.1951	0.0005875	0.2473	952.9	2.897×10^{-7}	9.847×10^{-9}
43000	42995	382.50	-94.37	15.76	399.4	0.1886	0.0005660	0.2383	948.9	2.877×10^{-7}	9.776×10^{-9}
44000	43995	379.34	-97.93	16.12	386.3	0.1824	0.0005452	0.2295	944.8	2.857×10^{-7}	9.705×10^{-9}
45000	44995	376.17	-101.50	16.49	373.8	0.1766	0.0005251	0.2211	940.8	2.837×10^{-7}	9.634×10^{-9}
46000	45995	373.00	-105.07	16.86	362.0	0.1710	0.0005058	0.2129	936.7	2.817×10^{-7}	9.563×10^{-9}
47000	46994	369.84	-108.63	17.22	350.7	0.1657	0.0004871	0.2051	932.7	2.797×10^{-7}	9.492×10^{-9}
48000	47994	366.67	-112.20	17.59	339.9	0.1606	0.0004691	0.1975	928.6	2.777×10^{-7}	9.421×10^{-9}
49000	48994	363.50	-115.77	17.96	329.6	0.1557	0.0004518	0.1902	924.5	2.757×10^{-7}	9.350×10^{-9}
50000	49994	360.34	-119.33	18.32	319.8	0.1511	0.0004351	0.1832	920.4	2.737×10^{-7}	9.279×10^{-9}
51000	50993	357.17	-122.90	18.69	310.4	0.1466	0.0004189	0.1764	916.3	2.717×10^{-7}	9.208×10^{-9}
52000	51993	354.00	-126.47	19.06	301.4	0.1424	0.0004034	0.1698	912.2	2.697×10^{-7}	9.137×10^{-9}
53000	52993	350.84	-130.03	19.42	292.8	0.1383	0.0003884	0.1635	908.1	2.677×10^{-7}	9.066×10^{-9}
54000	53993	347.67	-133.60	19.79	284.6	0.1345	0.0003739	0.1574	904.0	2.657×10^{-7}	8.995×10^{-9}
55000	54992	344.50	-137.17	20.16	276.7	0.1307	0.0003599	0.1515	899.8	2.637×10^{-7}	8.924×10^{-9}
56000	55992	341.34	-140.73	20.52	269.1	0.1272	0.0003465	0.1458	895.7	2.617×10^{-7}	8.853×10^{-9}
57000	56992	338.17	-144.30	20.89	261.8	0.1237	0.0003335	0.1404	891.5	2.597×10^{-7}	8.782×10^{-9}
58000	57992	335.00	-147.87	21.26	254.8	0.1204	0.0003211	0.1351	887.3	2.577×10^{-7}	8.711×10^{-9}
59000	58991	331.84	-151.43	21.62	248.0	0.1172	0.0003091	0.1301	883.1	2.557×10^{-7}	8.640×10^{-9}
60000	59991	328.67	-155.00	21.99	241.5	0.1141	0.0002976	0.1252	878.9	2.537×10^{-7}	8.569×10^{-9}
61000	60991	325.50	-158.57	22.36	235.2	0.1111	0.0002865	0.1206	874.7	2.517×10^{-7}	8.498×10^{-9}
62000	61991	322.34	-162.13	22.72	229.2	0.1083	0.0002759	0.1161	870.5	2.497×10^{-7}	8.427×10^{-9}
63000	62990	319.17	-165.70	23.09	223.3	0.1055	0.0002657	0.1118	866.3	2.477×10^{-7}	8.356×10^{-9}
64000	63990	316.00	-169.27	23.46	217.7	0.1029	0.0002559	0.1077	862.1	2.457×10^{-7}	8.285×10^{-9}
65000	64990	312.84	-172.83	23.82	212.3	0.1003	0.0002465	0.1037	857.8	2.437×10^{-7}	8.214×10^{-9}
66000	65990	309.67	-176.40	24.19	207.1	0.09784	0.0002375	0.09994	853.6	2.417×10^{-7}	8.143×10^{-9}
67000	66989	306.50	-179.97	24.56	202.1	0.09548	0.0002288	0.09629	849.3	2.397×10^{-7}	8.072×10^{-9}
68000	67989	303.34	-183.53	24.92	197.3	0.09321	0.0002205	0.09278	845.1	2.377×10^{-7}	8.001×10^{-9}
69000	68989	300.17	-187.10	25.29	192.6	0.09101	0.0002125	0.08941	840.8	2.357×10^{-7}	7.930×10^{-9}
70000	69989	297.00	-190.67	25.66	188.1	0.08889	0.0002049	0.08616	836.5	2.337×10^{-7}	7.859×10^{-9}
71000	70988	293.84	-194.23	26.02	183.7	0.08683	0.0001976	0.08302	832.2	2.317×10^{-7}	7.788×10^{-9}
72000	71988	290.67	-197.80	26.39	179.5	0.08484	0.0001906	0.08000	827.9	2.297×10^{-7}	7.717×10^{-9}
73000	72988	287.50	-201.37	26.76	175.4	0.08291	0.0001839	0.07708	823.6	2.277×10^{-7}	7.646×10^{-9}
74000	73987	284.34	-204.93	27.12	171.4	0.08104	0.0001775	0.07427	819.3	2.257×10^{-7}	7.575×10^{-9}
75000	74987	281.17	-208.50	27.49	167.5	0.07923	0.0001714	0.07156	815.0	2.237×10^{-7}	7.504×10^{-9}
76000	75987	278.00	-212.07	27.86	163.8	0.07748	0.0001655	0.06895	810.7	2.217×10^{-7}	7.433×10^{-9}
77000	76987	274.84	-215.63	28.22	160.1	0.07578	0.0001599	0.06643	806.4	2.197×10^{-7}	7.362×10^{-9}
78000	77986	271.67	-219.20	28.59	156.5	0.07414	0.0001545	0.06401	802.1	2.177×10^{-7}	7.291×10^{-9}
79000	78986	268.50	-222.77	28.96	153.1	0.07254	0.0001494	0.06168	797.7	2.157×10^{-7}	7.220×10^{-9}
80000	79986	265.34	-226.33	29.32	149.7	0.07100	0.0001445	0.05944	793.4	2.137×10^{-7}	7.149×10^{-9}

Table 5.2 – Continued

[illegible]

[illegible] ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
h, ft	z, ft	T, °R	t, °F	$T - T_{sl}$, °R	p, lb/ft²	p/p_{sl}	ρ, slug/ft³	ρ/ρ_{sl}	a, ft/sec	μ, lb-sec/ft²	k, Btu/ft-sec-°R
[illegible]											

Table 5.2 – Continued

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
H, m	Z, m	T, K	t, °C	$T - T_{ISA}$, K	P / P_0	P, Pa	ρ / ρ_0	ρ, kg/m³	a, m/s	μ, Pa·s	λ, W/(m·K)
0	0	288.15	15.00	0.00	1.0000	101325	1.0000	1.2250	340.29	$1.7894 \cdot 10^{-5}$	$2.5325 \cdot 10^{-2}$
100	100	287.65	14.50	0.00	0.9887	100174	0.9920	1.2163	339.73	$1.7846 \cdot 10^{-5}$	$2.5235 \cdot 10^{-2}$
200	200	287.15	14.00	0.00	0.9774	99029	0.9841	1.2076	339.17	$1.7798 \cdot 10^{-5}$	$2.5145 \cdot 10^{-2}$
300	300	286.65	13.50	0.00	0.9662	97891	0.9761	1.1989	338.62	$1.7750 \cdot 10^{-5}$	$2.5055 \cdot 10^{-2}$
400	400	286.15	13.00	0.00	0.9549	96760	0.9681	1.1901	338.06	$1.7702 \cdot 10^{-5}$	$2.4965 \cdot 10^{-2}$
500	500	285.65	12.50	0.00	0.9438	95635	0.9601	1.1813	337.50	$1.7654 \cdot 10^{-5}$	$2.4875 \cdot 10^{-2}$
600	600	285.15	12.00	0.00	0.9326	94518	0.9521	1.1725	336.94	$1.7606 \cdot 10^{-5}$	$2.4785 \cdot 10^{-2}$
700	700	284.65	11.50	0.00	0.9216	93407	0.9441	1.1636	336.38	$1.7558 \cdot 10^{-5}$	$2.4695 \cdot 10^{-2}$
800	800	284.15	11.00	0.00	0.9106	92303	0.9361	1.1547	335.82	$1.7510 \cdot 10^{-5}$	$2.4605 \cdot 10^{-2}$
900	900	283.65	10.50	0.00	0.8996	91206	0.9281	1.1458	335.25	$1.7462 \cdot 10^{-5}$	$2.4515 \cdot 10^{-2}$
1000	1000	283.15	10.00	0.00	0.8887	90115	0.9201	1.1368	334.69	$1.7414 \cdot 10^{-5}$	$2.4425 \cdot 10^{-2}$
1100	1100	282.65	9.50	0.00	0.8779	89031	0.9121	1.1278	334.13	$1.7366 \cdot 10^{-5}$	$2.4335 \cdot 10^{-2}$
1200	1200	282.15	9.00	0.00	0.8671	87953	0.9041	1.1188	333.56	$1.7318 \cdot 10^{-5}$	$2.4245 \cdot 10^{-2}$
1300	1300	281.65	8.50	0.00	0.8564	86881	0.8961	1.1098	333.00	$1.7270 \cdot 10^{-5}$	$2.4155 \cdot 10^{-2}$
1400	1400	281.15	8.00	0.00	0.8458	85816	0.8881	1.1007	332.43	$1.7222 \cdot 10^{-5}$	$2.4065 \cdot 10^{-2}$
1500	1500	280.65	7.50	0.00	0.8352	84757	0.8801	1.0916	331.87	$1.7174 \cdot 10^{-5}$	$2.3975 \cdot 10^{-2}$
1600	1600	280.15	7.00	0.00	0.8247	83704	0.8721	1.0825	331.30	$1.7126 \cdot 10^{-5}$	$2.3885 \cdot 10^{-2}$
1700	1700	279.65	6.50	0.00	0.8142	82657	0.8641	1.0734	330.73	$1.7078 \cdot 10^{-5}$	$2.3795 \cdot 10^{-2}$
1800	1800	279.15	6.00	0.00	0.8038	81616	0.8561	1.0643	330.17	$1.7030 \cdot 10^{-5}$	$2.3705 \cdot 10^{-2}$
1900	1900	278.65	5.50	0.00	0.7935	80581	0.8481	1.0552	329.60	$1.6982 \cdot 10^{-5}$	$2.3615 \cdot 10^{-2}$
2000	2000	278.15	5.00	0.00	0.7833	79552	0.8401	1.0460	329.03	$1.6934 \cdot 10^{-5}$	$2.3525 \cdot 10^{-2}$
2100	2100	277.65	4.50	0.00	0.7731	78529	0.8321	1.0369	328.46	$1.6886 \cdot 10^{-5}$	$2.3435 \cdot 10^{-2}$
2200	2200	277.15	4.00	0.00	0.7630	77512	0.8241	1.0277	327.89	$1.6838 \cdot 10^{-5}$	$2.3345 \cdot 10^{-2}$
2300	2300	276.65	3.50	0.00	0.7530	76501	0.8161	1.0185	327.32	$1.6790 \cdot 10^{-5}$	$2.3255 \cdot 10^{-2}$
2400	2400	276.15	3.00	0.00	0.7430	75496	0.8081	1.0093	326.75	$1.6742 \cdot 10^{-5}$	$2.3165 \cdot 10^{-2}$
2500	2500	275.65	2.50	0.00	0.7331	74497	0.8001	1.0001	326.18	$1.6694 \cdot 10^{-5}$	$2.3075 \cdot 10^{-2}$
2600	2600	275.15	2.00	0.00	0.7233	73504	0.7921	0.9909	325.61	$1.6646 \cdot 10^{-5}$	$2.2985 \cdot 10^{-2}$
2700	2700	274.65	1.50	0.00	0.7135	72517	0.7841	0.9817	325.04	$1.6598 \cdot 10^{-5}$	$2.2895 \cdot 10^{-2}$
2800	2800	274.15	1.00	0.00	0.7038	71536	0.7761	0.9724	324.46	$1.6550 \cdot 10^{-5}$	$2.2805 \cdot 10^{-2}$
2900	2900	273.65	0.50	0.00	0.6942	70561	0.7681	0.9632	323.89	$1.6502 \cdot 10^{-5}$	$2.2715 \cdot 10^{-2}$
3000	3000	273.15	0.00	0.00	0.6846	69592	0.7601	0.9539	323.31	$1.6454 \cdot 10^{-5}$	$2.2625 \cdot 10^{-2}$
3100	3100	272.65	-0.50	0.00	0.6751	68629	0.7521	0.9446	322.74	$1.6406 \cdot 10^{-5}$	$2.2535 \cdot 10^{-2}$
3200	3200	272.15	-1.00	0.00	0.6656	67672	0.7441	0.9353	322.16	$1.6358 \cdot 10^{-5}$	$2.2445 \cdot 10^{-2}$
3300	3300	271.65	-1.50	0.00	0.6562	66721	0.7361	0.9260	321.58	$1.6310 \cdot 10^{-5}$	$2.2355 \cdot 10^{-2}$
3400	3400	271.15	-2.00	0.00	0.6469	65776	0.7281	0.9167	321.00	$1.6262 \cdot 10^{-5}$	$2.2265 \cdot 10^{-2}$
3500	3500	270.65	-2.50	0.00	0.6376	64837	0.7201	0.9074	320.42	$1.6214 \cdot 10^{-5}$	$2.2175 \cdot 10^{-2}$
3600	3600	270.15	-3.00	0.00	0.6284	63904	0.7121	0.8980	319.84	$1.6166 \cdot 10^{-5}$	$2.2085 \cdot 10^{-2}$
3700	3700	269.65	-3.50	0.00	0.6192	62977	0.7041	0.8887	319.26	$1.6118 \cdot 10^{-5}$	$2.1995 \cdot 10^{-2}$
3800	3800	269.15	-4.00	0.00	0.6101	62056	0.6961	0.8793	318.68	$1.6070 \cdot 10^{-5}$	$2.1905 \cdot 10^{-2}$
3900	3900	268.65	-4.50	0.00	0.6011	61141	0.6881	0.8699	318.10	$1.6022 \cdot 10^{-5}$	$2.1815 \cdot 10^{-2}$
4000	4000	268.15	-5.00	0.00	0.5921	60232	0.6801	0.8605	317.51	$1.5974 \cdot 10^{-5}$	$2.1725 \cdot 10^{-2}$
4100	4100	267.65	-5.50	0.00	0.5832	59329	0.6721	0.8511	316.93	$1.5926 \cdot 10^{-5}$	$2.1635 \cdot 10^{-2}$
4200	4200	267.15	-6.00	0.00	0.5743	58432	0.6641	0.8417	316.34	$1.5878 \cdot 10^{-5}$	$2.1545 \cdot 10^{-2}$
4300	4300	266.65	-6.50	0.00	0.5655	57541	0.6561	0.8323	315.76	$1.5830 \cdot 10^{-5}$	$2.1455 \cdot 10^{-2}$
4400	4400	266.15	-7.00	0.00	0.5568	56656	0.6481	0.8228	315.17	$1.5782 \cdot 10^{-5}$	$2.1365 \cdot 10^{-2}$
4500	4500	265.65	-7.50	0.00	0.5481	55777	0.6401	0.8134	314.58	$1.5734 \cdot 10^{-5}$	$2.1275 \cdot 10^{-2}$
4600	4600	265.15	-8.00	0.00	0.5394	54904	0.6321	0.8039	313.99	$1.5686 \cdot 10^{-5}$	$2.1185 \cdot 10^{-2}$
4700	4700	264.65	-8.50	0.00	0.5308	54037	0.6241	0.7944	313.40	$1.5638 \cdot 10^{-5}$	$2.1095 \cdot 10^{-2}$
4800	4800	264.15	-9.00	0.00	0.5223	53176	0.6161	0.7849	312.81	$1.5590 \cdot 10^{-5}$	$2.1005 \cdot 10^{-2}$
4900	4900	263.65	-9.50	0.00	0.5138	52321	0.6081	0.7754	312.22	$1.5542 \cdot 10^{-5}$	$2.0915 \cdot 10^{-2}$
5000	5000	263.15	-10.00	0.00	0.5054	51472	0.6001	0.7659	311.63	$1.5494 \cdot 10^{-5}$	$2.0825 \cdot 10^{-2}$
5100	5100	262.65	-10.50	0.00	0.4971	50629	0.5921	0.7564	311.03	$1.5446 \cdot 10^{-5}$	$2.0735 \cdot 10^{-2}$
5200	5200	262.15	-11.00	0.00	0.4888	49792	0.5841	0.7468	310.44	$1.5398 \cdot 10^{-5}$	$2.0645 \cdot 10^{-2}$
5300	5300	261.65	-11.50	0.00	0.4806	48961	0.5761	0.7373	309.84	$1.5350 \cdot 10^{-5}$	$2.0555 \cdot 10^{-2}$
5400	5400	261.15	-12.00	0.00	0.4724	48136	0.5681	0.7277	309.24	$1.5302 \cdot 10^{-5}$	$2.0465 \cdot 10^{-2}$
5500	5500	260.65	-12.50	0.00	0.4643	47317	0.5601	0.7181	308.64	$1.5254 \cdot 10^{-5}$	$2.0375 \cdot 10^{-2}$
5600	5600	260.15	-13.00	0.00	0.4563	46504	0.5521	0.7085	308.04	$1.5206 \cdot 10^{-5}$	$2.0285 \cdot 10^{-2}$
5700	5700	259.65	-13.50	0.00	0.4483	45697	0.5441	0.6989	307.44	$1.5158 \cdot 10^{-5}$	$2.0195 \cdot 10^{-2}$
5800	5800	259.15	-14.00	0.00	0.4404	44896	0.5361	0.6893	306.84	$1.5110 \cdot 10^{-5}$	$2.0105 \cdot 10^{-2}$
5900	5900	258.65	-14.50	0.00	0.4325	44101	0.5281	0.6796	306.24	$1.5062 \cdot 10^{-5}$	$2.0015 \cdot 10^{-2}$
6000	6000	258.15	-15.00	0.00	0.4247	43312	0.5201	0.6700	305.63	$1.5014 \cdot 10^{-5}$	$1.9925 \cdot 10^{-2}$
6100	6100	257.65	-15.50	0.00	0.4170	42529	0.5121	0.6603	305.03	$1.4966 \cdot 10^{-5}$	$1.9835 \cdot 10^{-2}$
6200	6200	257.15	-16.00	0.00	0.4093	41752	0.5041	0.6506	304.42	$1.4918 \cdot 10^{-5}$	$1.9745 \cdot 10^{-2}$
6300	6300	256.65	-16.50	0.00	0.4017	40981	0.4961	0.6409	303.81	$1.4870 \cdot 10^{-5}$	$1.9655 \cdot 10^{-2}$
6400	6400	256.15	-17.00	0.00	0.3941	40216	0.4881	0.6312	303.21	$1.4822 \cdot 10^{-5}$	$1.9565 \cdot 10^{-2}$
6500	6500	255.65	-17.50	0.00	0.3866	39457	0.4801	0.6215	302.60	$1.4774 \cdot 10^{-5}$	$1.9475 \cdot 10^{-2}$
6600	6600	255.15	-18.00	0.00	0.3791	38704	0.4721	0.6118	301.99	$1.4726 \cdot 10^{-5}$	$1.9385 \cdot 10^{-2}$
6700	6700	254.65	-18.50	0.00	0.3717	37957	0.4641	0.6021	301.38	$1.4678 \cdot 10^{-5}$	$1.9295 \cdot 10^{-2}$
6800	6800	254.15	-19.00	0.00	0.3643	37216	0.4561	0.5924	300.77	$1.4630 \cdot 10^{-5}$	$1.9205 \cdot 10^{-2}$
6900	6900	253.65	-19.50	0.00	0.3570	36481	0.4481	0.5827	300.16	$1.4582 \cdot 10^{-5}$	$1.9115 \cdot 10^{-2}$
7000	7000	253.15	-20.00	0.00	0.3497	35752	0.4401	0.5730	299.55	$1.4534 \cdot 10^{-5}$	$1.9025 \cdot 10^{-2}$

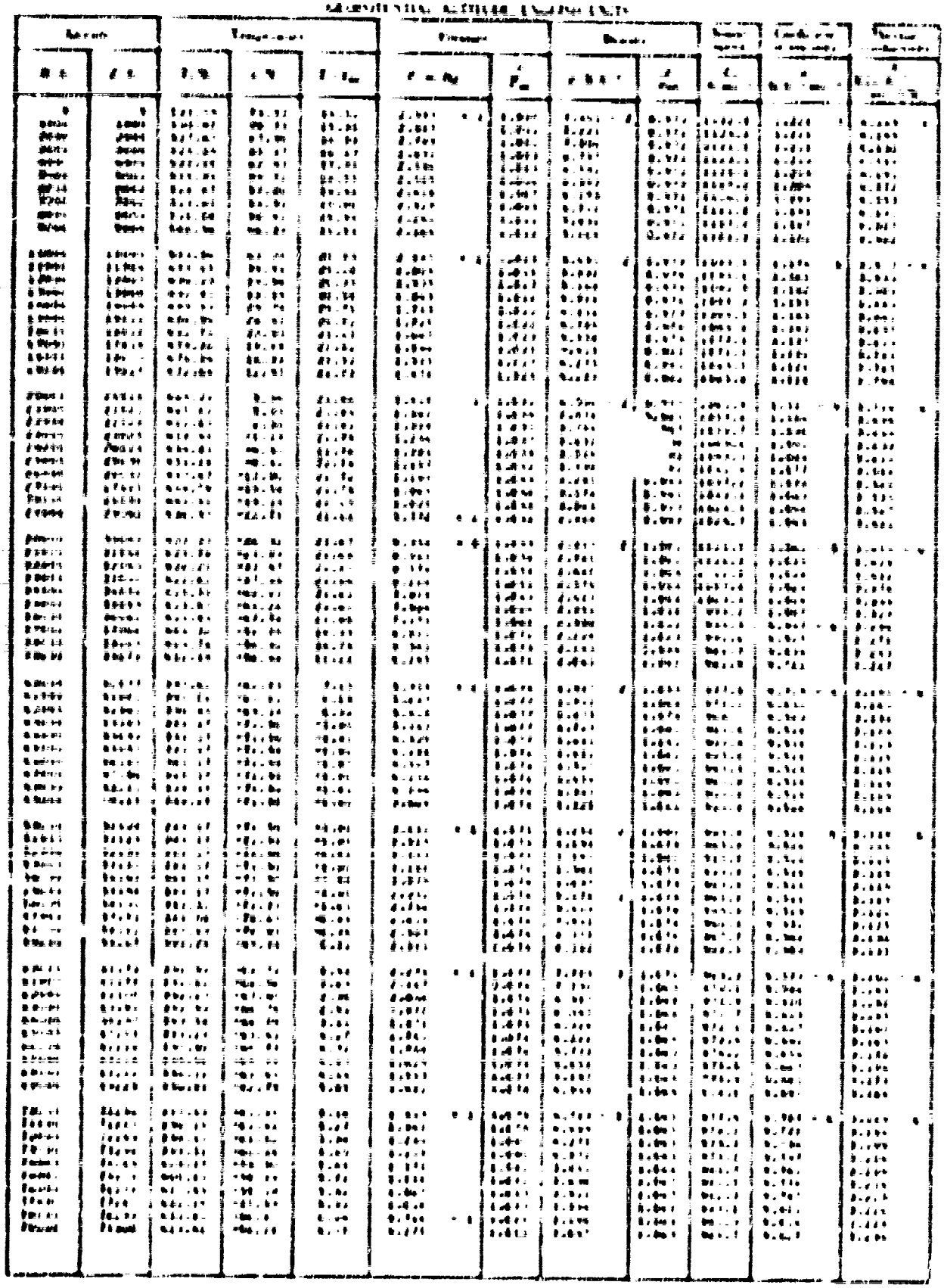
TABLE A.2 – Continued
U.S. Standard
ALTITUDE, POTENTIAL, AND GEOPOTENTIAL HEIGHT

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
z	z_g	T	t	$T - T_m$	p	p/p_0	ρ	ρ/ρ_0	a	μ	k
km	km	K	°C	K	mb		kg/m³		m/s	kg/(m·s)	W/(m·K)
0	0	288.15	15.00	−0.02	1.013 × 10³	1.0000	1.225	1.0000	340.29	1.789 × 10⁻⁵	2.533 × 10⁻²
0.5000	0.5000	284.90	11.75	−0.02	954.61	0.9421	1.167	0.9529	338.37	1.761	2.493
1.0000	1.0000	281.65	8.50	−0.03	898.76	0.8870	1.112	0.9075	336.43	1.732	2.453
1.5000	1.5000	278.40	5.25	−0.03	845.60	0.8345	1.058	0.8638	334.48	1.703	2.412
2.0000	2.0000	275.15	2.00	−0.04	795.01	0.7846	1.007	0.8217	332.52	1.673	2.371
2.5000	2.5000	271.90	−1.25	−0.04	746.86	0.7372	0.9569	0.7812	330.54	1.643	2.329
3.0000	2.9999	268.65	−4.50	−0.05	701.04	0.6920	0.9093	0.7423	328.55	1.613	2.287
3.5000	3.4999	265.40	−7.75	−0.05	657.45	0.6490	0.8638	0.7052	326.54	1.582	2.244
4.0000	3.9999	262.15	−11.00	−0.06	615.99	0.6081	0.8202	0.6696	324.52	1.551	2.201
4.5000	4.4999	258.90	−14.25	−0.06	576.58	0.5691	0.7786	0.6357	322.48	1.519	2.157
5.0000	4.9999	255.65	−17.50	−0.07	539.14	0.5321	0.7389	0.6032	320.43	1.487	2.113
5.5000	5.4999	252.40	−20.75	−0.07	503.58	0.4970	0.7010	0.5723	318.36	1.455	2.068
6.0000	5.9999	249.15	−24.00	−0.08	469.84	0.4637	0.6649	0.5428	316.27	1.422	2.023
6.5000	6.4999	245.90	−27.25	−0.08	437.85	0.4321	0.6306	0.5148	314.16	1.388	1.977
7.0000	6.9999	242.65	−30.50	−0.09	407.55	0.4022	0.5979	0.4881	312.03	1.354	1.931
7.5000	7.4999	239.40	−33.75	−0.09	378.89	0.3740	0.5669	0.4628	309.88	1.320	1.884
8.0000	7.9999	236.15	−37.00	−0.10	351.79	0.3471	0.5374	0.4387	307.70	1.285	1.837
8.5000	8.4999	232.90	−40.25	−0.10	326.22	0.3219	0.5094	0.4159	305.50	1.249	1.789
9.0000	8.9999	229.65	−43.50	−0.11	302.12	0.2981	0.4829	0.3943	303.28	1.213	1.741
9.5000	9.4999	226.40	−46.75	−0.11	279.46	0.2758	0.4578	0.3738	301.03	1.176	1.692
10.0000	9.9999	223.15	−50.00	−0.12	258.20	0.2548	0.4340	0.3544	298.75	1.139	1.643
10.5000	10.4999	219.90	−53.25	−0.12	238.29	0.2351	0.4116	0.3361	296.45	1.101	1.593
11.0000	10.9999	216.65	−56.50	−0.13	219.71	0.2168	0.3904	0.3187	294.12	1.062	1.542
11.5000	11.4999	216.65	−56.50	−0.13	202.53	0.1998	0.3600	0.2939	294.12	1.062	1.542
12.0000	11.9999	216.65	−56.50	−0.13	186.73	0.1843	0.3319	0.2710	294.12	1.062	1.542
12.5000	12.4999	216.65	−56.50	−0.13	172.23	0.1700	0.3060	0.2498	294.12	1.062	1.542
13.0000	12.9999	216.65	−56.50	−0.13	158.89	0.1568	0.2822	0.2304	294.12	1.062	1.542
13.5000	13.4999	216.65	−56.50	−0.13	146.62	0.1447	0.2602	0.2125	294.12	1.062	1.542
14.0000	13.9999	216.65	−56.50	−0.13	135.33	0.1335	0.2401	0.1960	294.12	1.062	1.542
14.5000	14.4999	216.65	−56.50	−0.13	124.90	0.1233	0.2216	0.1809	294.12	1.062	1.542
15.0000	14.9999	216.65	−56.50	−0.13	115.29	0.1138	0.2046	0.1670	294.12	1.062	1.542
15.5000	15.4999	216.65	−56.50	−0.13	106.43	0.1050	0.1889	0.1542	294.12	1.062	1.542
16.0000	15.9999	216.65	−56.50	−0.13	98.24	0.0970	0.1744	0.1424	294.12	1.062	1.542
16.5000	16.4999	216.65	−56.50	−0.13	90.69	0.0895	0.1610	0.1315	294.12	1.062	1.542
17.0000	16.9999	216.65	−56.50	−0.13	83.72	0.0826	0.1486	0.1214	294.12	1.062	1.542
17.5000	17.4999	216.65	−56.50	−0.13	77.28	0.0763	0.1372	0.1121	294.12	1.062	1.542
18.0000	17.9999	216.65	−56.50	−0.13	71.33	0.0704	0.1267	0.1035	294.12	1.062	1.542
18.5000	18.4999	216.65	−56.50	−0.13	65.84	0.0650	0.1169	0.0955	294.12	1.062	1.542
19.0000	18.9999	216.65	−56.50	−0.13	60.79	0.0600	0.1079	0.0882	294.12	1.062	1.542
19.5000	19.4999	216.65	−56.50	−0.13	56.12	0.0554	0.0997	0.0814	294.12	1.062	1.542
20.0000	19.9999	216.65	−56.50	−0.13	51.80	0.0511	0.0920	0.0752	294.12	1.062	1.542
20.5000	20.4999	216.65	−56.50	−0.13	47.82	0.0472	0.0850	0.0694	294.12	1.062	1.542
21.0000	20.9999	216.65	−56.50	−0.13	44.14	0.0436	0.0785	0.0641	294.12	1.062	1.542
21.5000	21.4999	216.65	−56.50	−0.13	40.75	0.0402	0.0725	0.0592	294.12	1.062	1.542
22.0000	21.9999	216.65	−56.50	−0.13	37.63	0.0371	0.0669	0.0547	294.12	1.062	1.542
22.5000	22.4999	216.65	−56.50	−0.13	34.75	0.0343	0.0618	0.0505	294.12	1.062	1.542
23.0000	22.9999	216.65	−56.50	−0.13	32.09	0.0317	0.0571	0.0466	294.12	1.062	1.542
23.5000	23.4999	216.65	−56.50	−0.13	29.64	0.0292	0.0527	0.0431	294.12	1.062	1.542
24.0000	23.9999	216.65	−56.50	−0.13	27.38	0.0270	0.0487	0.0398	294.12	1.062	1.542
24.5000	24.4999	216.65	−56.50	−0.13	25.29	0.0250	0.0450	0.0368	294.12	1.062	1.542
25.0000	24.9999	216.65	−56.50	−0.13	23.36	0.0231	0.0416	0.0340	294.12	1.062	1.542
25.5000	25.4999	216.65	−56.50	−0.13	21.58	0.0213	0.0384	0.0314	294.12	1.062	1.542
26.0000	25.9999	216.65	−56.50	−0.13	19.94	0.0197	0.0355	0.0290	294.12	1.062	1.542
26.5000	26.4999	216.65	−56.50	−0.13	18.43	0.0182	0.0328	0.0268	294.12	1.062	1.542
27.0000	26.9999	216.65	−56.50	−0.13	17.03	0.0168	0.0303	0.0248	294.12	1.062	1.542
27.5000	27.4999	216.65	−56.50	−0.13	15.74	0.0155	0.0280	0.0229	294.12	1.062	1.542
28.0000	27.9999	216.65	−56.50	−0.13	14.55	0.0144	0.0259	0.0212	294.12	1.062	1.542
28.5000	28.4999	216.65	−56.50	−0.13	13.45	0.0133	0.0239	0.0196	294.12	1.062	1.542
29.0000	28.9999	216.65	−56.50	−0.13	12.43	0.0123	0.0221	0.0181	294.12	1.062	1.542
29.5000	29.4999	216.65	−56.50	−0.13	11.49	0.0113	0.0204	0.0167	294.12	1.062	1.542
30.0000	29.9999	216.65	−56.50	−0.13	10.63	0.0105	0.0189	0.0155	294.12	1.062	1.542
30.5000	30.4999	216.65	−56.50	−0.13	9.83	0.0097	0.0175	0.0143	294.12	1.062	1.542
31.0000	30.9999	216.65	−56.50	−0.13	9.09	0.0090	0.0162	0.0132	294.12	1.062	1.542
31.5000	31.4999	216.65	−56.50	−0.13	8.41	0.0083	0.0150	0.0122	294.12	1.062	1.542
32.0000	31.9999	216.65	−56.50	−0.13	7.78	0.0077	0.0139	0.0113	294.12	1.062	1.542
32.5000	32.4999	216.65	−56.50	−0.13	7.20	0.0071	0.0128	0.0105	294.12	1.062	1.542
33.0000	32.9999	216.65	−56.50	−0.13	6.66	0.0066	0.0119	0.0097	294.12	1.062	1.542
33.5000	33.4999	216.65	−56.50	−0.13	6.16	0.0061	0.0110	0.0090	294.12	1.062	1.542
34.0000	33.9999	216.65	−56.50	−0.13	5.70	0.0056	0.0102	0.0083	294.12	1.062	1.542
34.5000	34.4999	216.65	−56.50	−0.13	5.27	0.0052	0.0094	0.0077	294.12	1.062	1.542
35.0000	34.9999	216.65	−56.50	−0.13	4.88	0.0048	0.0087	0.0071	294.12	1.062	1.542
35.5000	35.4999	216.65	−56.50	−0.13	4.52	0.0044	0.0081	0.0066	294.12	1.062	1.542
36.0000	35.9999	216.65	−56.50	−0.13	4.18	0.0041	0.0075	0.0061	294.12	1.062	1.542
36.5000	36.4999	216.65	−56.50	−0.13	3.87	0.0038	0.0069	0.0056	294.12	1.062	1.542
37.0000	36.9999	216.65	−56.50	−0.13	3.58	0.0035	0.0064	0.0052	294.12	1.062	1.542
37.5000	37.4999	216.65	−56.50	−0.13	3.31	0.0032	0.0059	0.0048	294.12	1.062	1.542
38.0000	37.9999	216.65	−56.50	−0.13	3.06	0.0030	0.0055	0.0044	294.12	1.062	1.542
38.5000	38.4999	216.65	−56.50	−0.13	2.83	0.0028	0.0051	0.0041	294.12	1.062	1.542
39.0000	38.9999	216.65	−56.50	−0.13	2.62	0.0026	0.0047	0.0038	294.12	1.062	1.542
39.5000	39.4999	216.65	−56.50	−0.13	2.42	0.0024	0.0043	0.0035	294.12	1.062	1.542
40.0000	39.9999	216.65	−56.50	−0.13	2.24	0.0022	0.0040	0.0032	294.12	1.062	1.542
40.5000	40.4999	216.65	−56.50	−0.13	2.07	0.0020	0.0037	0.0030	294.12	1.062	1.542
41.0000	40.9999	216.65	−56.50	−0.13	1.92	0.0019	0.0034	0.0028	294.12	1.062	1.542
41.5000	41.4999	216.65	−56.50	−0.13	1.77	0.0017	0.0032	0.0026	294.12	1.062	1.542
42.0000	41.9999	216.65	−56.50	−0.13	1.64	0.0016	0.0029	0.0024	294.12	1.062	1.542
42.5000	42.4999	216.65	−56.50	−0.13	1.52	0.0015	0.0027	0.0022	294.12	1.062	1.542
43.0000	42.9999	216.65	−56.50	−0.13	1.40	0.0014	0.0025	0.0020	294.12	1.062	1.542
43.5000	43.4999	216.65	−56.50	−0.13	1.30	0.0013	0.0023	0.0019	294.12	1.062	1.542
44.0000	43.9999	216.65	−56.50	−0.13	1.20	0.0012	0.0021	0.0017	294.12	1.062	1.542
44.5000	44.4999	216.65	−56.50	−0.13	1.11	0.0011	0.0020	0.0016	294.12	1.062	1.542
45.0000	44.9999	216.65	−56.50	−0.13	1.03	0.0010	0.0018	0.0015	294.12	1.062	1.542
45.5000	45.4999	216.65	−56.50	−0.13	0.95	0.0009	0.0017	0.0014	294.12	1.062	1.542
46.0000	45.9999	216.65	−56.50	−0.13	0.88	0.0009	0.0016	0.0013	294.12	1.062	1.542
46.5000	46.4999	216.65	−56.50	−0.13	0.81	0.0008	0.0015	0.0012	294.12	1.062	1.542
47.0000	46.9999	216.65	−56.50	−0.13	0.75	0.0007	0.0014	0.0011	294.12	1.062	1.542
47.5000	47.4999	216.65	−56.50	−0.13	0.69	0.0007	0.0013	0.0010	294.12	1.062	1.542
48.0000	47.9999	216.65	−56.50	−0.13	0.64	0.0006	0.0012	0.0009	294.12	1.062	1.542
48.5000	48.4999	216.65	−56.50	−0.13	0.59	0.0006	0.0011	0.0009	294.12	1.062	1.542
49.0000	48.9999	216.65	−56.50	−0.13	0.55	0.0005	0.0010	0.0008	294.12	1.062	1.542
49.5000	49.4999	216.65	−56.50	−0.13	0.51	0.0005	0.0009	0.0007	294.12	1.062	1.542
50.0000	49.9999	216.65	−56.50	−0.13	0.47	0.0005	0.0009	0.0007	294.12	1.062	1.542

TABLE XI – Continued

(EXPERIMENTAL ELECTRICAL ENGINEERING UNITS)

Table 5.2 – Continued



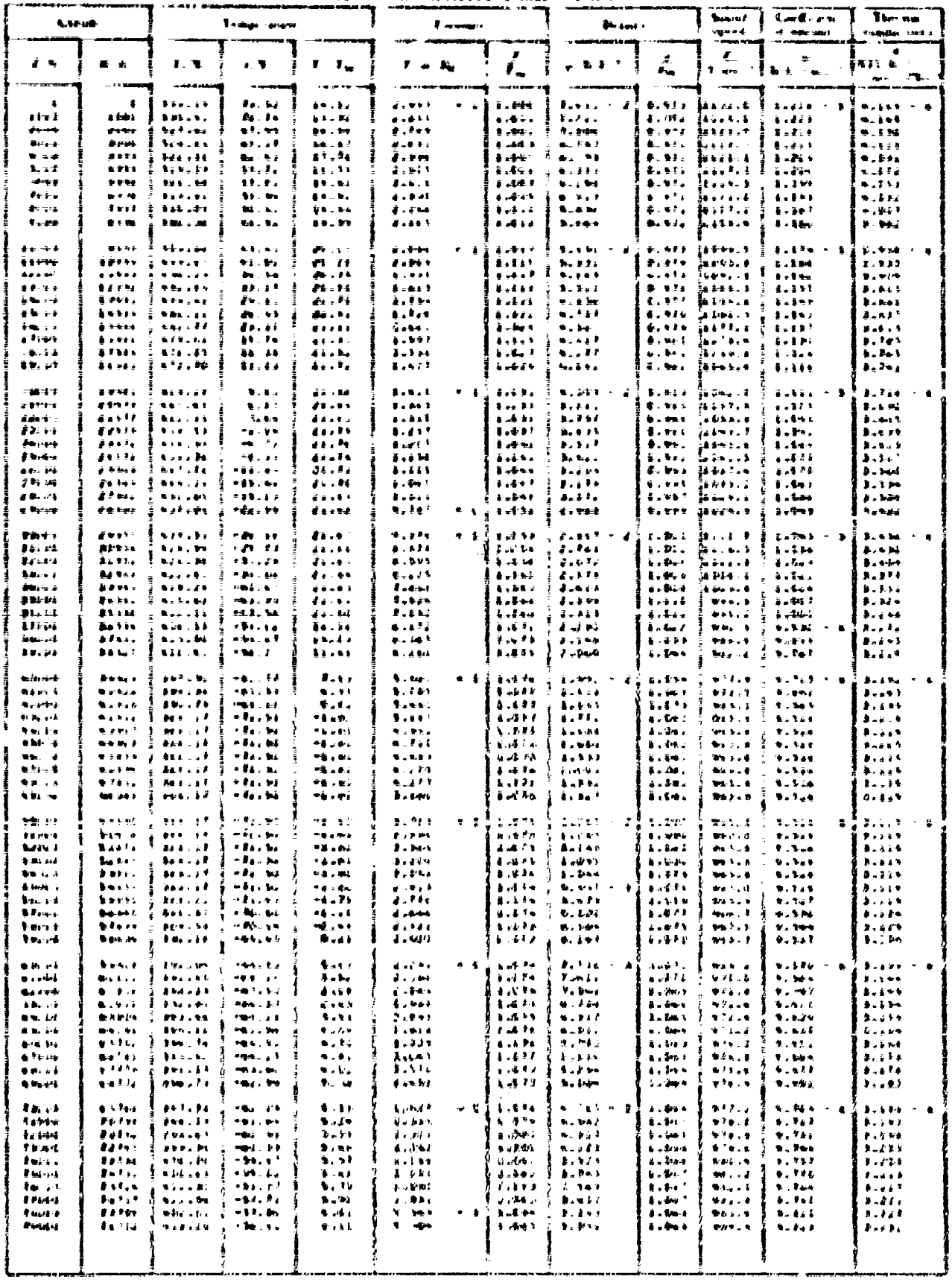


Table 3.2 – Continued

45° N Jan

GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, ft	Z, ft	T, °R	t, °F	[illegible]	P, in. Hg	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 5.1 – Continued

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
z, km	H, km	T, K	t, °C	$T - T_{sl}$	p, mb	$\frac{p}{p_{sl}}$	ρ, kg/m³	$\frac{\rho}{\rho_{sl}}$	a, m/s	μ, kg/(m·s)	k, W/(m·K)
0.000	0.000	288.15	15.00	0.00	1013.25	1.0000	1.2250	1.0000	340.29	1.7894×10^{-5}	2.5343×10^{-2}
0.500	0.500	284.90	11.75	−3.25	954.61	0.9421	1.1673	0.9529	338.37	1.7579×10^{-5}	2.5044×10^{-2}
1.000	1.000	281.65	8.50	−6.50	898.76	0.8870	1.1117	0.9075	336.43	1.7260×10^{-5}	2.4740×10^{-2}
1.500	1.499	278.40	5.25	−9.75	845.60	0.8345	1.0581	0.8638	334.48	1.6938×10^{-5}	2.4433×10^{-2}
2.000	1.999	275.15	2.00	−13.00	794.98	0.7846	1.0066	0.8217	332.52	1.6612×10^{-5}	2.4122×10^{-2}
2.500	2.498	271.90	−1.25	−16.25	746.83	0.7370	0.9569	0.7812	330.54	1.6282×10^{-5}	2.3807×10^{-2}
3.000	2.997	268.65	−4.50	−19.50	701.07	0.6918	0.9092	0.7423	328.55	1.5949×10^{-5}	2.3487×10^{-2}
3.500	3.496	265.40	−7.75	−22.75	657.65	0.6490	0.8633	0.7048	326.54	1.5612×10^{-5}	2.3163×10^{-2}
4.000	3.995	262.15	−11.00	−26.00	616.51	0.6085	0.8191	0.6689	324.52	1.5271×10^{-5}	2.2834×10^{-2}
4.500	4.494	258.90	−14.25	−29.25	577.59	0.5701	0.7768	0.6343	322.48	1.4926×10^{-5}	2.2500×10^{-2}
5.000	4.992	255.65	−17.50	−32.50	540.86	0.5338	0.7361	0.6010	320.43	1.4577×10^{-5}	2.2161×10^{-2}
5.500	5.491	252.40	−20.75	−35.75	506.26	0.4996	0.6971	0.5691	318.36	1.4223×10^{-5}	2.1817×10^{-2}
6.000	5.989	249.15	−24.00	−39.00	473.74	0.4676	0.6597	0.5386	316.27	1.3865×10^{-5}	2.1467×10^{-2}
6.500	6.488	245.90	−27.25	−42.25	443.26	0.4376	0.6238	0.5093	314.16	1.3502×10^{-5}	2.1112×10^{-2}
7.000	6.986	242.65	−30.50	−45.50	414.77	0.4094	0.5895	0.4813	312.03	1.3135×10^{-5}	2.0751×10^{-2}
7.500	7.484	239.40	−33.75	−48.75	388.22	0.3831	0.5567	0.4546	309.88	1.2763×10^{-5}	2.0385×10^{-2}
8.000	7.982	236.15	−37.00	−52.00	363.57	0.3589	0.5253	0.4289	307.70	1.2387×10^{-5}	2.0013×10^{-2}
8.500	8.480	232.90	−40.25	−55.25	340.77	0.3365	0.4952	0.4044	305.51	1.2005×10^{-5}	1.9635×10^{-2}
9.000	8.978	229.65	−43.50	−58.50	319.77	0.3158	0.4664	0.3809	303.29	1.1619×10^{-5}	1.9251×10^{-2}
9.500	9.476	226.40	−46.75	−61.75	300.54	0.2968	0.4389	0.3584	301.05	1.1228×10^{-5}	1.8861×10^{-2}
10.000	9.974	223.15	−50.00	−65.00	283.01	0.2794	0.4125	0.3369	298.79	1.0831×10^{-5}	1.8465×10^{-2}
10.500	10.471	219.90	−53.25	−68.25	267.14	0.2637	0.3873	0.3163	296.51	1.0429×10^{-5}	1.8063×10^{-2}
11.000	10.968	216.65	−56.50	−71.50	252.89	0.2496	0.3632	0.2967	294.20	1.0022×10^{-5}	1.7655×10^{-2}
11.500	11.465	216.65	−56.50	−71.50	239.22	0.2361	0.3436	0.2807	294.20	1.0022×10^{-5}	1.7655×10^{-2}
12.000	11.962	216.65	−56.50	−71.50	226.32	0.2234	0.3250	0.2654	294.20	1.0022×10^{-5}	1.7655×10^{-2}
12.500	12.459	216.65	−56.50	−71.50	214.09	0.2113	0.3074	0.2511	294.20	1.0022×10^{-5}	1.7655×10^{-2}
13.000	12.956	216.65	−56.50	−71.50	202.51	0.1999	0.2909	0.2376	294.20	1.0022×10^{-5}	1.7655×10^{-2}
13.500	13.452	216.65	−56.50	−71.50	191.57	0.1891	0.2752	0.2247	294.20	1.0022×10^{-5}	1.7655×10^{-2}
14.000	13.949	216.65	−56.50	−71.50	181.23	0.1789	0.2603	0.2126	294.20	1.0022×10^{-5}	1.7655×10^{-2}
14.500	14.445	216.65	−56.50	−71.50	171.46	0.1692	0.2462	0.2011	294.20	1.0022×10^{-5}	1.7655×10^{-2}
15.000	14.941	216.65	−56.50	−71.50	162.24	0.1601	0.2329	0.1902	294.20	1.0022×10^{-5}	1.7655×10^{-2}
15.500	15.437	216.65	−56.50	−71.50	153.54	0.1515	0.2203	0.1800	294.20	1.0022×10^{-5}	1.7655×10^{-2}
16.000	15.933	216.65	−56.50	−71.50	145.34	0.1434	0.2085	0.1703	294.20	1.0022×10^{-5}	1.7655×10^{-2}
16.500	16.429	216.65	−56.50	−71.50	137.61	0.1358	0.1973	0.1612	294.20	1.0022×10^{-5}	1.7655×10^{-2}
17.000	16.925	216.65	−56.50	−71.50	130.33	0.1286	0.1868	0.1526	294.20	1.0022×10^{-5}	1.7655×10^{-2}
17.500	17.421	216.65	−56.50	−71.50	123.48	0.1219	0.1768	0.1444	294.20	1.0022×10^{-5}	1.7655×10^{-2}
18.000	17.916	216.65	−56.50	−71.50	117.05	0.1155	0.1673	0.1367	294.20	1.0022×10^{-5}	1.7655×10^{-2}
18.500	18.412	216.65	−56.50	−71.50	111.00	0.1095	0.1584	0.1294	294.20	1.0022×10^{-5}	1.7655×10^{-2}
19.000	18.907	216.65	−56.50	−71.50	105.32	0.1039	0.1499	0.1225	294.20	1.0022×10^{-5}	1.7655×10^{-2}
19.500	19.402	216.65	−56.50	−71.50	99.99	0.0987	0.1419	0.1159	294.20	1.0022×10^{-5}	1.7655×10^{-2}
20.000	19.897	216.65	−56.50	−71.50	94.97	0.0937	0.1343	0.1097	294.20	1.0022×10^{-5}	1.7655×10^{-2}
20.500	20.392	216.65	−56.50	−71.50	90.25	0.0891	0.1272	0.1039	294.20	1.0022×10^{-5}	1.7655×10^{-2}
21.000	20.887	216.65	−56.50	−71.50	85.81	0.0847	0.1204	0.0984	294.20	1.0022×10^{-5}	1.7655×10^{-2}
21.500	21.382	216.65	−56.50	−71.50	81.63	0.0806	0.1140	0.0931	294.20	1.0022×10^{-5}	1.7655×10^{-2}
22.000	21.877	216.65	−56.50	−71.50	77.69	0.0767	0.1079	0.0882	294.20	1.0022×10^{-5}	1.7655×10^{-2}
22.500	22.371	216.65	−56.50	−71.50	73.97	0.0730	0.1022	0.0835	294.20	1.0022×10^{-5}	1.7655×10^{-2}
23.000	22.866	216.65	−56.50	−71.50	70.46	0.0696	0.0967	0.0791	294.20	1.0022×10^{-5}	1.7655×10^{-2}
23.500	23.360	216.65	−56.50	−71.50	67.14	0.0663	0.0916	0.0748	294.20	1.0022×10^{-5}	1.7655×10^{-2}
24.000	23.854	216.65	−56.50	−71.50	63.99	0.0632	0.0867	0.0709	294.20	1.0022×10^{-5}	1.7655×10^{-2}
24.500	24.348	216.65	−56.50	−71.50	61.00	0.0602	0.0821	0.0671	294.20	1.0022×10^{-5}	1.7655×10^{-2}
25.000	24.842	216.65	−56.50	−71.50	58.17	0.0574	0.0777	0.0635	294.20	1.0022×10^{-5}	1.7655×10^{-2}
25.500	25.336	216.65	−56.50	−71.50	55.47	0.0548	0.0736	0.0601	294.20	1.0022×10^{-5}	1.7655×10^{-2}
26.000	25.830	216.65	−56.50	−71.50	52.91	0.0522	0.0696	0.0569	294.20	1.0022×10^{-5}	1.7655×10^{-2}
26.500	26.324	216.65	−56.50	−71.50	50.48	0.0498	0.0659	0.0538	294.20	1.0022×10^{-5}	1.7655×10^{-2}
27.000	26.818	216.65	−56.50	−71.50	48.17	0.0475	0.0624	0.0510	294.20	1.0022×10^{-5}	1.7655×10^{-2}
27.500	27.312	216.65	−56.50	−71.50	45.97	0.0454	0.0590	0.0482	294.20	1.0022×10^{-5}	1.7655×10^{-2}
28.000	27.806	216.65	−56.50	−71.50	43.87	0.0433	0.0559	0.0457	294.20	1.0022×10^{-5}	1.7655×10^{-2}
28.500	28.299	216.65	−56.50	−71.50	41.87	0.0413	0.0529	0.0432	294.20	1.0022×10^{-5}	1.7655×10^{-2}
29.000	28.793	216.65	−56.50	−71.50	39.97	0.0394	0.0501	0.0409	294.20	1.0022×10^{-5}	1.7655×10^{-2}
29.500	29.286	216.65	−56.50	−71.50	38.16	0.0376	0.0474	0.0387	294.20	1.0022×10^{-5}	1.7655×10^{-2}
30.000	29.780	216.65	−56.50	−71.50	36.43	0.0359	0.0449	0.0367	294.20	1.0022×10^{-5}	1.7655×10^{-2}

Table 5.2 – Continued

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Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
[illegible]	[illegible]	[illegible]	[illegible]	$T - T_{sl}$	[illegible]	$\frac{P}{P_{sl}}$	[illegible]	$\frac{\rho}{\rho_{sl}}$	[illegible]	[illegible]	[illegible]
0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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TABLE 3.2 – Continued

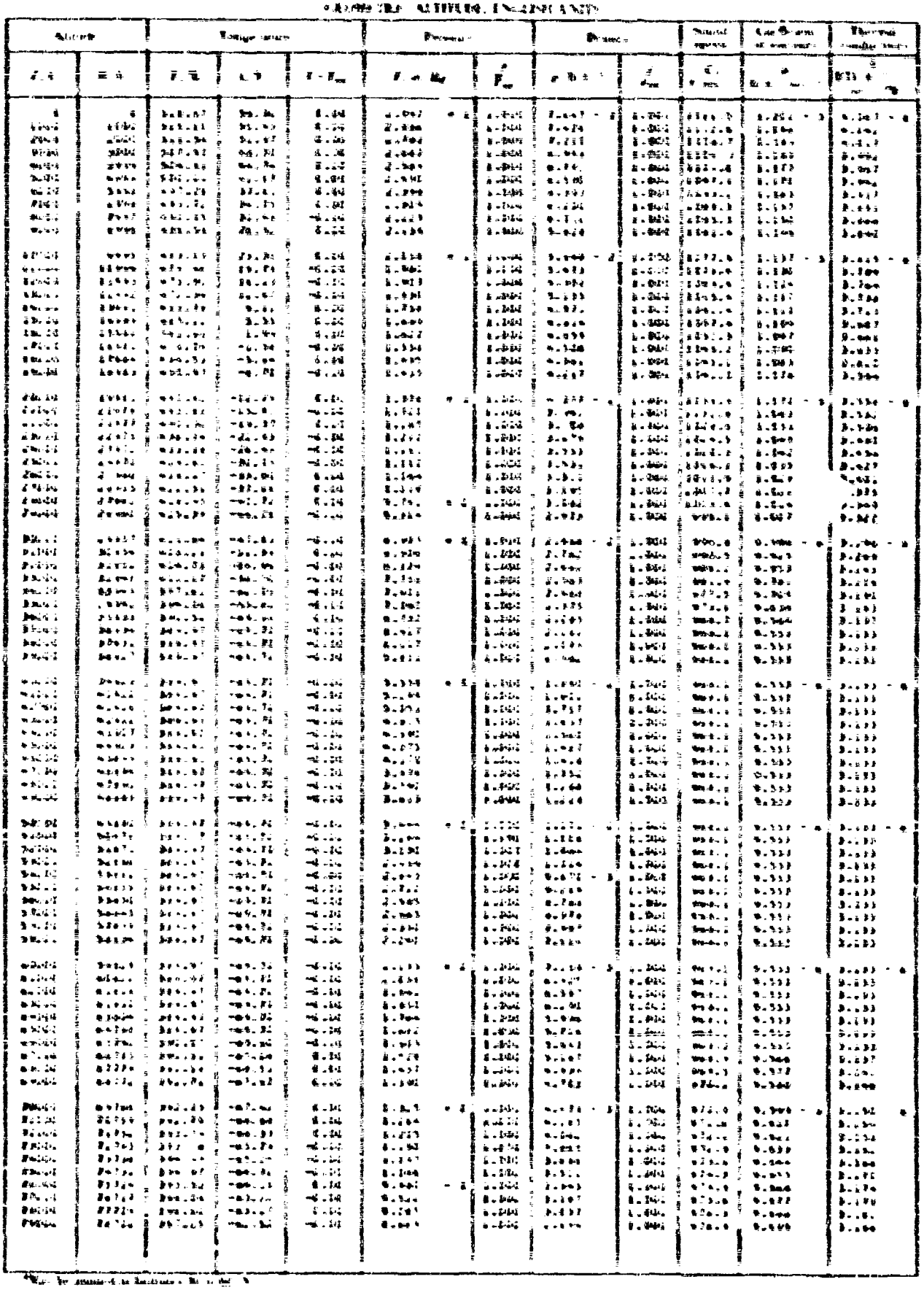

Table 5.2 – Continued
Mid-Latitude Spring/Fall*
GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
H, ft	Z, ft	T, °R	t, °F	$T - T_{std}$	P, in. Hg	P/P_{std}	ρ, lb ft⁻³	ρ/ρ_{std}	C_s, ft sec⁻¹	μ, lb ft⁻¹ sec⁻¹	k, BTU ft⁻¹ sec⁻¹ °R⁻¹
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*[illegible]

Table 5.2 — Continued

[illegible]

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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Table [illegible] — Continued

[illegible]

GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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Table 3.2 — Continued

60° N, January

GEOMETRIC ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
Z, ft	H, ft	T, °R	t, °F	$T - T_m$	P, in. Hg	P/P_0	ρ	ρ/ρ_0	C_s	μ	k
0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 5.2 - Continued

60° N January

GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
H, ft	Z, ft	T, °R	t, °F	T − T_s	P, in. Hg	P/P_s	ρ	ρ/ρ_s	C_s	μ	k

Table 5.2 – Continued

GEOMETRIC ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

Table 5.2 – Continued

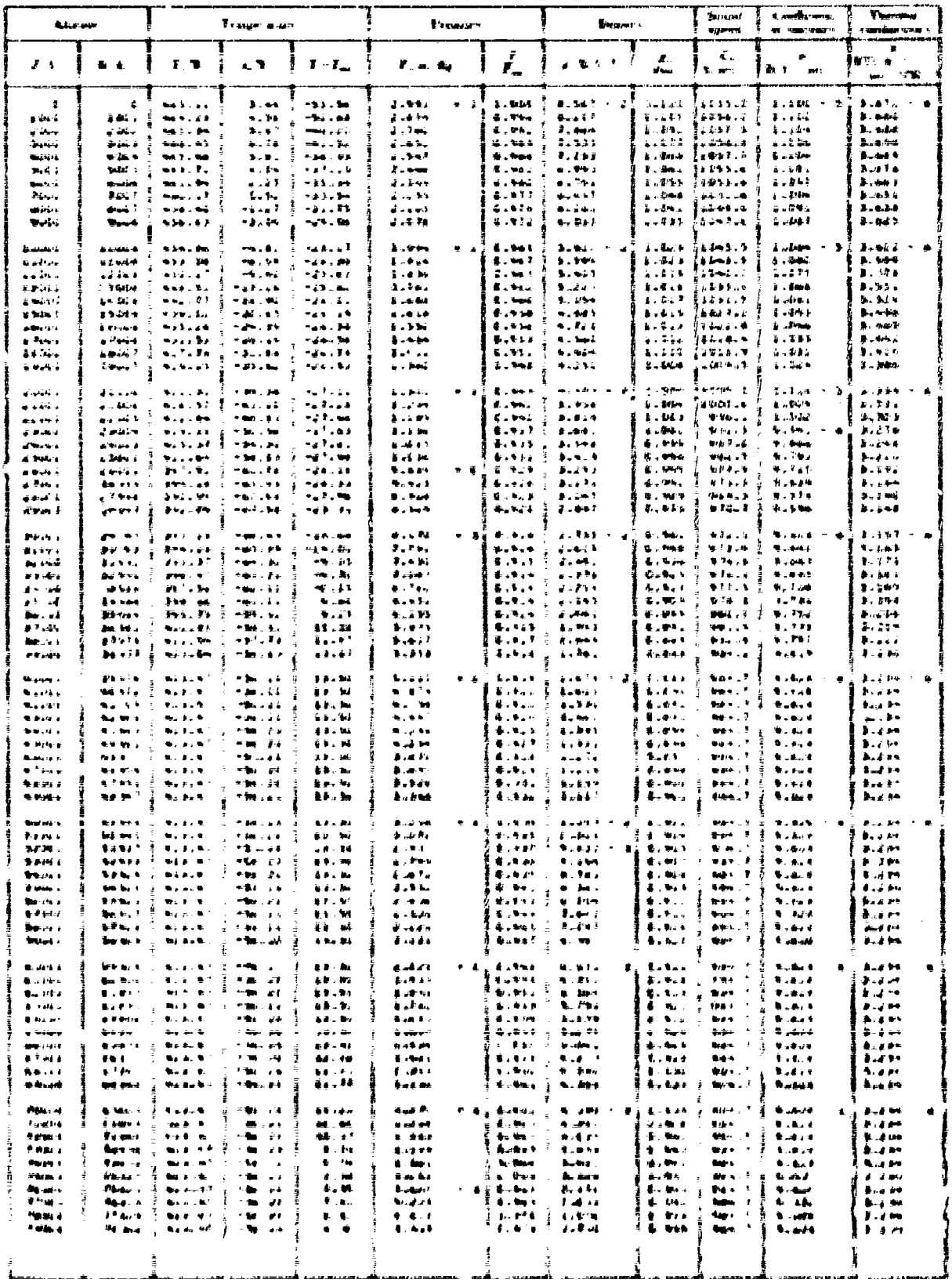

Table 52.—Continued

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 5.2. — Continued
60° N January (Cold)
GEOMETRIC ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, ft	H, ft	T, °R	t, °F	[illegible]	P, in. Hg	P/P₀	ρ, lb ft⁻³	ρ/ρ₀	C_s, ft sec⁻¹	μ	k
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 5.2 – Continued

[illegible]

GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Kinematic viscosity
[illegible]	[illegible]	T, °R	[illegible]	[illegible]	p, in. Hg	p/p_0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 5.2 — Continued

[illegible]

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 5.1 – Continued

GEOMETRIC SIMILAR ENGINES (MD)

A mode		Temperature			Pressure		Density		Velocity	Specific impulse	Thrust coefficient
M_∞	M_e	T_t/T_∞	T/T_∞	T_e/T_∞	P_t/P_∞	P/P_∞	ρ_t/ρ_∞	ρ/ρ_∞	V/a_∞	I_{sp}/a_∞	C_T
0.00000	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.00000	∞	1.57080
0.05000	0.05000	1.00125	1.00125	1.00125	1.00188	1.00188	1.00063	1.00063	0.05000	20.00000	1.57080
0.10000	0.10000	1.00500	1.00500	1.00500	1.00753	1.00753	1.00251	1.00251	0.10000	10.00000	1.57080
0.15000	0.15000	1.01125	1.01125	1.01125	1.01695	1.01695	1.00564	1.00564	0.15000	6.66667	1.57080
0.20000	0.20000	1.02000	1.02000	1.02000	1.03015	1.03015	1.01007	1.01007	0.20000	5.00000	1.57080
0.25000	0.25000	1.03125	1.03125	1.03125	1.04707	1.04707	1.01574	1.01574	0.25000	4.00000	1.57080
0.30000	0.30000	1.04500	1.04500	1.04500	1.06773	1.06773	1.02267	1.02267	0.30000	3.33333	1.57080
0.35000	0.35000	1.06125	1.06125	1.06125	1.09215	1.09215	1.03085	1.03085	0.35000	2.85714	1.57080
0.40000	0.40000	1.08000	1.08000	1.08000	1.12035	1.12035	1.04029	1.04029	0.40000	2.50000	1.57080
0.45000	0.45000	1.10125	1.10125	1.10125	1.15233	1.15233	1.05098	1.05098	0.45000	2.22222	1.57080
0.50000	0.50000	1.12500	1.12500	1.12500	1.18810	1.18810	1.06292	1.06292	0.50000	2.00000	1.57080
0.55000	0.55000	1.15125	1.15125	1.15125	1.22765	1.22765	1.07612	1.07612	0.55000	1.81818	1.57080
0.60000	0.60000	1.18000	1.18000	1.18000	1.27099	1.27099	1.09057	1.09057	0.60000	1.66667	1.57080
0.65000	0.65000	1.21125	1.21125	1.21125	1.31812	1.31812	1.10627	1.10627	0.65000	1.53846	1.57080
0.70000	0.70000	1.24500	1.24500	1.24500	1.36904	1.36904	1.12323	1.12323	0.70000	1.42857	1.57080
0.75000	0.75000	1.28125	1.28125	1.28125	1.42375	1.42375	1.14144	1.14144	0.75000	1.33333	1.57080
0.80000	0.80000	1.32000	1.32000	1.32000	1.48225	1.48225	1.16091	1.16091	0.80000	1.25000	1.57080
0.85000	0.85000	1.36125	1.36125	1.36125	1.54454	1.54454	1.18163	1.18163	0.85000	1.17647	1.57080
0.90000	0.90000	1.40500	1.40500	1.40500	1.61062	1.61062	1.20361	1.20361	0.90000	1.11111	1.57080
0.95000	0.95000	1.45125	1.45125	1.45125	1.68049	1.68049	1.22684	1.22684	0.95000	1.05263	1.57080
1.00000	1.00000	1.50000	1.50000	1.50000	1.75415	1.75415	1.25132	1.25132	1.00000	1.00000	1.57080
1.05000	1.05000	1.55125	1.55125	1.55125	1.83160	1.83160	1.27705	1.27705	1.05000	0.95238	1.57080
1.10000	1.10000	1.60500	1.60500	1.60500	1.91284	1.91284	1.30403	1.30403	1.10000	0.90909	1.57080
1.15000	1.15000	1.66125	1.66125	1.66125	1.99787	1.99787	1.33226	1.33226	1.15000	0.86957	1.57080
1.20000	1.20000	1.72000	1.72000	1.72000	2.08669	2.08669	1.36174	1.36174	1.20000	0.83333	1.57080
1.25000	1.25000	1.78125	1.78125	1.78125	2.17930	2.17930	1.39247	1.39247	1.25000	0.80000	1.57080
1.30000	1.30000	1.84500	1.84500	1.84500	2.27570	2.27570	1.42445	1.42445	1.30000	0.76923	1.57080
1.35000	1.35000	1.91125	1.91125	1.91125	2.37589	2.37589	1.45768	1.45768	1.35000	0.74074	1.57080
1.40000	1.40000	1.98000	1.98000	1.98000	2.47987	2.47987	1.49216	1.49216	1.40000	0.71429	1.57080
1.45000	1.45000	2.05125	2.05125	2.05125	2.58764	2.58764	1.52789	1.52789	1.45000	0.68966	1.57080
1.50000	1.50000	2.12500	2.12500	2.12500	2.69920	2.69920	1.56487	1.56487	1.50000	0.66667	1.57080
1.55000	1.55000	2.20125	2.20125	2.20125	2.81455	2.81455	1.60310	1.60310	1.55000	0.64516	1.57080
1.60000	1.60000	2.28000	2.28000	2.28000	2.93369	2.93369	1.64258	1.64258	1.60000	0.62500	1.57080
1.65000	1.65000	2.36125	2.36125	2.36125	3.05662	3.05662	1.68331	1.68331	1.65000	0.60606	1.57080
1.70000	1.70000	2.44500	2.44500	2.44500	3.18334	3.18334	1.72529	1.72529	1.70000	0.58824	1.57080
1.75000	1.75000	2.53125	2.53125	2.53125	3.31385	3.31385	1.76852	1.76852	1.75000	0.57143	1.57080
1.80000	1.80000	2.62000	2.62000	2.62000	3.44815	3.44815	1.81300	1.81300	1.80000	0.55556	1.57080
1.85000	1.85000	2.71125	2.71125	2.71125	3.58624	3.58624	1.85873	1.85873	1.85000	0.54054	1.57080
1.90000	1.90000	2.80500	2.80500	2.80500	3.72812	3.72812	1.90571	1.90571	1.90000	0.52632	1.57080
1.95000	1.95000	2.90125	2.90125	2.90125	3.87379	3.87379	1.95394	1.95394	1.95000	0.51282	1.57080
2.00000	2.00000	3.00000	3.00000	3.00000	4.02325	4.02325	2.00342	2.00342	2.00000	0.50000	1.57080
2.05000	2.05000	3.10125	3.10125	3.10125	4.17650	4.17650	2.05415	2.05415	2.05000	0.48780	1.57080
2.10000	2.10000	3.20500	3.20500	3.20500	4.33354	4.33354	2.10613	2.10613	2.10000	0.47619	1.57080
2.15000	2.15000	3.31125	3.31125	3.31125	4.49437	4.49437	2.15936	2.15936	2.15000	0.46512	1.57080
2.20000	2.20000	3.42000	3.42000	3.42000	4.65899	4.65899	2.21384	2.21384	2.20000	0.45455	1.57080
2.25000	2.25000	3.53125	3.53125	3.53125	4.82740	4.82740	2.26957	2.26957	2.25000	0.44444	1.57080
2.30000	2.30000	3.64500	3.64500	3.64500	4.99960	4.99960	2.32655	2.32655	2.30000	0.43478	1.57080
2.35000	2.35000	3.76125	3.76125	3.76125	5.17559	5.17559	2.38478	2.38478	2.35000	0.42553	1.57080
2.40000	2.40000	3.88000	3.88000	3.88000	5.35537	5.35537	2.44426	2.44426	2.40000	0.41667	1.57080
2.45000	2.45000	4.00125	4.00125	4.00125	5.53894	5.53894	2.50499	2.50499	2.45000	0.40816	1.57080
2.50000	2.50000	4.12500	4.12500	4.12500	5.72630	5.72630	2.56697	2.56697	2.50000	0.40000	1.57080
2.55000	2.55000	4.25125	4.25125	4.25125	5.91745	5.91745	2.63020	2.63020	2.55000	0.39216	1.57080
2.60000	2.60000	4.38000	4.38000	4.38000	6.11239	6.11239	2.69468	2.69468	2.60000	0.38462	1.57080
2.65000	2.65000	4.51125	4.51125	4.51125	6.31113	6.31113	2.76041	2.76041	2.65000	0.37736	1.57080
2.70000	2.70000	4.64500	4.64500	4.64500	6.51365	6.51365	2.82739	2.82739	2.70000	0.37037	1.57080
2.75000	2.75000	4.78125	4.78125	4.78125	6.71997	6.71997	2.89562	2.89562	2.75000	0.36364	1.57080
2.80000	2.80000	4.92000	4.92000	4.92000	6.93008	6.93008	2.96510	2.96510	2.80000	0.35714	1.57080
2.85000	2.85000	5.06125	5.06125	5.06125	7.14398	7.14398	3.03583	3.03583	2.85000	0.35088	1.57080
2.90000	2.90000	5.20500	5.20500	5.20500	7.36167	7.36167	3.10781	3.10781	2.90000	0.34483	1.57080
2.95000	2.95000	5.35125	5.35125	5.35125	7.58316	7.58316	3.18104	3.18104	2.95000	0.33898	1.57080
3.00000	3.00000	5.50000	5.50000	5.50000	7.80844	7.80844	3.25552	3.25552	3.00000	0.33333	1.57080

TABLE 5.3 — Continued

GEOMETRIC ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z ft	H ft	T °R	t °F	T − T₀	P in Hg	P/P₀	ρ	ρ/ρ₀	C_s	μ	k
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 5.2 – Continued

[illegible]

[illegible] ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 3.2 – Continued

[illegible]

GEOMETRIC, ENGINEERING UNITS

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Thermal conductivity
h, ft	h, m	T, °R	t, °F	$T - T_{std}$, °R	p, lb/ft²	$\frac{p}{p_{std}}$	ρ, slug/ft³	$\frac{\rho}{\rho_{std}}$	a, ft/sec	μ, lb-sec/ft²	k, Btu/ft-sec-°R
[illegible]											

TABLE 5.2 – Continued

GEOPOTENTIAL ALTITUDE ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Speed of sound	Acceleration of gravity	Viscosity

TABLE XI – Continued

GEOMETRIC ALTITUDE, FEET (M)

Altitude		Temperature			Pressure		Density		Speed of sound	Coefficient of viscosity	Viscosity parameter
H	Z	T, °R	t, °F	$T - T_{sl}$	P, lb/sq ft	$\frac{P}{P_{sl}}$	ρ, slugs/cu ft	$\frac{\rho}{\rho_{sl}}$	a, fps	μ, lb-sec/sq ft	η, slugs/ft-sec
0	0	518.69	+59.03	0.00	2116.2	1.0000	2.3769 – 3	1.0000	1116.4	3.7372 – 7	3.7372 – 7
1000	1000	515.54	+55.88	−3.15	2040.9	0.9644	2.3446	0.9864	1112.7	3.7251	3.7251
2000	2000	512.39	+52.73	−6.30	1967.7	0.9298	2.3126	0.9729	1109.0	3.7130	3.7130
3000	3000	509.24	+49.58	−9.45	1896.8	0.8962	2.2810	0.9596	1105.3	3.7008	3.7008
4000	4000	506.09	+46.43	−12.60	1828.0	0.8637	2.2498	0.9465	1101.6	3.6886	3.6886
5000	5000	502.94	+43.28	−15.75	1761.2	0.8321	2.2189	0.9335	1097.9	3.6764	3.6764
6000	6000	499.79	+40.13	−18.90	1696.5	0.8015	2.1884	0.9207	1094.2	3.6642	3.6642
7000	7000	496.64	+36.98	−22.05	1633.7	0.7718	2.1583	0.9080	1090.5	3.6519	3.6519
8000	8000	493.49	+33.83	−25.20	1572.8	0.7431	2.1285	0.8955	1086.8	3.6396	3.6396
9000	9000	490.34	+30.68	−28.35	1513.8	0.7152	2.0991	0.8831	1083.1	3.6273	3.6273
10000	10000	487.19	+27.53	−31.50	1456.6	0.6882	2.0700	0.8709	1079.4	3.6150	3.6150
11000	11000	484.04	+24.38	−34.65	1401.3	0.6621	2.0413	0.8588	1075.7	3.6026	3.6026
12000	12000	480.89	+21.23	−37.80	1347.7	0.6368	2.0129	0.8469	1071.9	3.5902	3.5902
13000	13000	477.74	+18.08	−40.95	1295.9	0.6123	1.9849	0.8351	1068.2	3.5778	3.5778
14000	14000	474.59	+14.93	−44.10	1245.8	0.5886	1.9572	0.8234	1064.4	3.5654	3.5654
15000	15000	471.44	+11.78	−47.25	1197.4	0.5658	1.9299	0.8119	1060.7	3.5529	3.5529
16000	16000	468.29	+8.63	−50.40	1150.6	0.5437	1.9029	0.8005	1056.9	3.5404	3.5404
17000	17000	465.14	+5.48	−53.55	1105.5	0.5224	1.8763	0.7893	1053.1	3.5279	3.5279
18000	18000	461.99	+2.33	−56.70	1061.9	0.5018	1.8500	0.7782	1049.3	3.5153	3.5153
19000	19000	458.84	−0.82	−59.85	1019.9	0.4820	1.8241	0.7673	1045.5	3.5027	3.5027
20000	20000	455.69	−3.97	−63.00	979.5	0.4629	1.7985	0.7565	1041.7	3.4901	3.4901
21000	21000	452.54	−7.12	−66.15	940.6	0.4445	1.7732	0.7459	1037.9	3.4774	3.4774
22000	22000	449.39	−10.27	−69.30	903.3	0.4268	1.7482	0.7354	1034.1	3.4647	3.4647
23000	23000	446.24	−13.42	−72.45	867.4	0.4098	1.7236	0.7251	1030.3	3.4519	3.4519
24000	24000	443.09	−16.57	−75.60	832.9	0.3935	1.6993	0.7149	1026.4	3.4391	3.4391
25000	25000	439.94	−19.72	−78.75	799.8	0.3778	1.6753	0.7048	1022.6	3.4263	3.4263
26000	26000	436.79	−22.87	−81.90	768.1	0.3628	1.6516	0.6948	1018.7	3.4134	3.4134
27000	27000	433.64	−26.02	−85.05	737.6	0.3484	1.6283	0.6850	1014.8	3.4005	3.4005
28000	28000	430.49	−29.17	−88.20	708.4	0.3346	1.6053	0.6753	1011.0	3.3875	3.3875
29000	29000	427.34	−32.32	−91.35	680.5	0.3214	1.5826	0.6657	1007.1	3.3745	3.3745
30000	30000	424.19	−35.47	−94.50	653.8	0.3089	1.5602	0.6562	1003.2	3.3615	3.3615
31000	31000	421.04	−38.62	−97.65	628.3	0.2968	1.5382	0.6469	999.3	3.3484	3.3484
32000	32000	417.89	−41.77	−100.80	603.9	0.2853	1.5165	0.6377	995.4	3.3353	3.3353
33000	33000	414.74	−44.92	−103.95	580.7	0.2743	1.4951	0.6287	991.5	3.3221	3.3221
34000	34000	411.59	−48.07	−107.10	558.5	0.2638	1.4740	0.6198	987.6	3.3089	3.3089
35000	35000	408.44	−51.22	−110.25	537.4	0.2539	1.4533	0.6110	983.6	3.2956	3.2956
36000	36000	405.29	−54.37	−113.40	517.3	0.2444	1.4329	0.6024	979.7	3.2823	3.2823
37000	37000	402.14	−57.52	−116.55	498.2	0.2354	1.4128	0.5939	975.7	3.2689	3.2689
38000	38000	398.99	−60.67	−119.70	480.1	0.2268	1.3930	0.5855	971.7	3.2555	3.2555
39000	39000	395.84	−63.82	−122.85	462.9	0.2187	1.3736	0.5773	967.7	3.2421	3.2421
40000	40000	392.69	−66.97	−126.00	446.6	0.2110	1.3545	0.5692	963.7	3.2286	3.2286
41000	41000	389.54	−70.12	−129.15	431.2	0.2037	1.3357	0.5613	959.7	3.2150	3.2150
42000	42000	386.39	−73.27	−132.30	416.6	0.1968	1.3172	0.5535	955.7	3.2014	3.2014
43000	43000	383.24	−76.42	−135.45	402.8	0.1903	1.2991	0.5459	951.6	3.1878	3.1878
44000	44000	380.09	−79.57	−138.60	389.7	0.1841	1.2813	0.5384	947.6	3.1741	3.1741
45000	45000	376.94	−82.72	−141.75	377.3	0.1783	1.2638	0.5310	943.5	3.1604	3.1604
46000	46000	373.79	−85.87	−144.90	365.6	0.1728	1.2466	0.5238	939.4	3.1466	3.1466
47000	47000	370.64	−89.02	−148.05	354.5	0.1675	1.2297	0.5167	935.3	3.1328	3.1328
48000	48000	367.49	−92.17	−151.20	343.9	0.1625	1.2131	0.5098	931.2	3.1190	3.1190
49000	49000	364.34	−95.32	−154.35	333.9	0.1578	1.1968	0.5029	927.1	3.1051	3.1051
50000	50000	361.19	−98.47	−157.50	324.5	0.1533	1.1808	0.4962	923.0	3.0912	3.0912
51000	51000	358.04	−101.62	−160.65	315.5	0.1491	1.1651	0.4896	918.8	3.0772	3.0772
52000	52000	354.89	−104.77	−163.80	306.9	0.1450	1.1497	0.4831	914.7	3.0632	3.0632
53000	53000	351.74	−107.92	−166.95	298.8	0.1412	1.1345	0.4767	910.5	3.0492	3.0492
54000	54000	348.59	−111.07	−170.10	291.0	0.1375	1.1196	0.4704	906.3	3.0351	3.0351
55000	55000	345.44	−114.22	−173.25	283.6	0.1340	1.1050	0.4643	902.1	3.0210	3.0210
56000	56000	342.29	−117.37	−176.40	276.5	0.1307	1.0906	0.4582	897.9	3.0068	3.0068
57000	57000	339.14	−120.52	−179.55	269.8	0.1275	1.0765	0.4523	893.7	2.9926	2.9926
58000	58000	335.99	−123.67	−182.70	263.4	0.1245	1.0626	0.4464	889.5	2.9784	2.9784
59000	59000	332.84	−126.82	−185.85	257.3	0.1216	1.0490	0.4406	885.2	2.9641	2.9641
60000	60000	329.69	−129.97	−189.00	251.5	0.1189	1.0356	0.4349	881.0	2.9498	2.9498

TABLE 5.2 – Continued
35° N January
GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, ft	Z, ft	T, °R	t, °F	$T - T_{std}$	P, lb/ft²	$\frac{P}{P_{std}}$	ρ, lb ft⁻³	$\frac{\rho}{\rho_{std}}$	a, ft sec⁻¹	μ, lb ft⁻¹ sec⁻¹	k, BTU ft⁻¹ sec⁻¹ °R⁻¹
0	0	498.59	-11.08	-70.08	2.993 + 1	1.000	8.844 - 2	1.157	1088.3	1.074 - 5	3.566 - 6
1000	998	490.24	-9.43	-84.86	2.871	0.995	8.452	1.138	1060.2	1.075	3.578
2000	1996	481.90	-7.77	-99.64	2.754	0.990	8.078	1.120	1042.1	1.078	3.590
3000	2994	473.55	-6.12	-56.42	2.642	0.985	7.722	1.104	1044.0	1.081	3.602
4000	3992	465.21	-4.46	-69.20	2.535	0.981	7.383	1.087	1045.9	1.085	3.615
5000	4990	456.49	-3.16	-44.34	2.433	0.977	7.066	1.072	1047.4	1.087	3.624
6000	5988	453.46	-6.21	-63.81	2.335	0.974	6.826	1.068	1043.9	1.081	3.602
7000	6987	450.42	-9.24	-83.28	2.240	0.970	6.595	1.064	1040.4	1.075	3.580
8000	7985	447.39	-12.28	-62.75	2.149	0.967	6.366	1.059	1036.9	1.070	3.558
9000	8984	444.36	-15.31	-92.21	2.060	0.963	6.146	1.055	1033.4	1.064	3.536
10000	9982	441.33	-18.34	-41.68	1.975 + 1	0.960	5.932 - 2	1.050	1029.9	1.059 - 5	3.513 - 6
11000	10981	438.30	-21.37	-41.14	1.892	0.956	5.723	1.045	1026.3	1.052	3.491
12000	11980	435.27	-24.40	-40.60	1.813	0.953	5.521	1.042	1022.8	1.046	3.469
13000	12979	432.25	-27.42	-40.06	1.736	0.949	5.325	1.037	1019.2	1.040	3.447
14000	13978	429.22	-30.45	-39.52	1.662	0.946	5.134	1.033	1015.6	1.034	3.425
15000	14977	426.20	-33.47	-38.98	1.591	0.943	4.949	1.028	1012.0	1.028	3.402
16000	15976	423.18	-36.49	-38.43	1.522	0.939	4.769	1.024	1008.5	1.022	3.380
17000	16976	420.16	-39.51	-37.89	1.456	0.935	4.594	1.020	1004.8	1.016	3.358
18000	17975	417.13	-42.54	-37.35	1.392	0.932	4.425	1.015	1001.2	1.010	3.335
19000	18975	414.11	-45.56	-36.80	1.331	0.928	4.261	1.011	997.6	1.004	3.313
20000	19974	411.09	-48.58	-36.26	1.272 + 1	0.925	4.101 - 2	1.006	993.9	9.981 - 6	3.290 - 6
21000	20974	408.07	-51.60	-35.71	1.215	0.922	3.947	1.002	990.3	9.920	3.268
22000	21974	405.05	-54.62	-35.17	1.160	0.918	3.797	0.998	986.6	9.859	3.245
23000	22974	402.03	-57.64	-34.62	1.108	0.915	3.652	0.993	982.9	9.798	3.223
24000	23974	399.01	-60.66	-34.07	1.057	0.911	3.511	0.989	979.2	9.737	3.200
25000	24974	395.99	-63.68	-33.53	1.008	0.908	3.375	0.985	975.5	9.676	3.178
26000	25974	392.97	-66.70	-32.98	9.615 + 0	0.904	3.243	0.980	971.8	9.614	3.155
27000	26974	389.95	-69.72	-32.44	9.165	0.901	3.116	0.976	968.0	9.552	3.132
28000	27975	387.24	-72.43	-31.58	8.733	0.898	2.990	0.971	964.7	9.497	3.112
29000	28975	386.97	-72.70	-28.26	8.321	0.895	2.850	0.960	964.3	9.491	3.110
30000	29976	386.69	-72.98	-24.99	7.927 + 0	0.892	2.718 - 2	0.950	964.0	9.485 - 6	3.108 - 6
31000	30977	386.42	-73.25	-21.70	7.552	0.890	2.591	0.940	963.7	9.480	3.106
32000	31977	386.14	-73.53	-18.41	7.194	0.888	2.470	0.930	963.3	9.474	3.104
33000	32978	385.87	-73.80	-15.12	6.853	0.886	2.354	0.920	963.0	9.468	3.102
34000	33979	385.59	-74.08	-11.83	6.528	0.884	2.244	0.912	962.6	9.463	3.100
35000	34980	385.32	-74.35	-8.53	6.218	0.883	2.139	0.903	962.3	9.457	3.098
36000	35981	385.05	-74.62	-5.24	5.923	0.882	2.039	0.894	961.9	9.451	3.095
37000	36983	384.77	-74.90	-5.20	5.641	0.882	1.944	0.894	961.6	9.446	3.093
38000	37984	384.45	-75.22	-5.52	5.373	0.881	1.853	0.894	961.2	9.439	3.091
39000	38985	384.01	-75.66	-5.96	5.117	0.881	1.767	0.894	960.7	9.430	3.088
40000	39987	383.58	-76.09	-6.39	4.873 + 0	0.880	1.684 - 2	0.894	960.1	9.421 - 6	3.084 - 6
41000	40989	383.14	-76.53	-6.83	4.641	0.879	1.606	0.895	959.6	9.412	3.081
42000	41990	382.70	-76.97	-7.27	4.419	0.879	1.531	0.895	959.0	9.403	3.078
43000	42992	382.26	-77.41	-7.71	4.208	0.878	1.459	0.895	958.5	9.394	3.074
44000	43994	381.82	-77.85	-8.15	4.006	0.877	1.391	0.896	957.9	9.385	3.071
45000	44996	381.38	-78.29	-8.59	3.814	0.876	1.326	0.896	957.4	9.376	3.068
46000	45998	380.94	-78.73	-9.03	3.631	0.875	1.264	0.896	956.8	9.366	3.065
47000	47000	380.50	-79.17	-9.47	3.457	0.874	1.204	0.895	956.3	9.357	3.062
48000	48003	380.06	-79.61	-9.91	3.291	0.873	1.148	0.895	955.7	9.348	3.058
49000	49005	379.63	-80.04	-10.34	3.132	0.872	1.094	0.895	955.1	9.339	3.055
50000	50008	379.19	-80.48	-10.78	2.981 + 0	0.870	1.042 - 2	0.895	954.6	9.330 - 6	3.051 - 6
51000	51010	378.75	-80.92	-11.22	2.837	0.869	9.931 - 3	0.895	954.0	9.321	3.048
52000	52013	378.31	-81.36	-11.66	2.700	0.868	9.462	0.895	953.5	9.312	3.045
53000	53016	377.87	-81.80	-12.10	2.570	0.867	9.015	0.894	952.9	9.303	3.041
54000	54019	377.43	-82.24	-12.54	2.445	0.865	8.588	0.894	952.4	9.294	3.038
55000	55022	376.99	-82.68	-12.98	2.327	0.864	8.182	0.894	951.8	9.284	3.035
56000	56025	376.55	-83.12	-13.42	2.214	0.862	7.794	0.893	951.3	9.275	3.031
57000	57028	376.11	-83.56	-13.86	2.106	0.861	7.424	0.893	950.7	9.266	3.028
58000	58031	375.67	-84.00	-14.30	2.004	0.860	7.071	0.892	950.2	9.257	3.025
59000	59034	375.24	-84.43	-14.73	1.906	0.858	6.734	0.891	949.6	9.248	3.021
60000	60038	374.80	-84.87	-15.17	1.813 + 0	0.856	6.414 - 3	0.891	949.1	9.239 - 6	3.016 - 6
61000	61041	374.36	-85.31	-15.61	1.725	0.855	6.108	0.890	948.5	9.230	3.015
62000	62045	373.92	-85.75	-16.05	1.641	0.853	5.816	0.889	947.9	9.220	3.011
63000	63049	373.77	-85.90	-16.20	1.560	0.851	5.534	0.888	947.8	9.217	3.010
64000	64053	373.77	-85.90	-16.20	1.484	0.849	5.263	0.886	947.8	9.217	3.010
65000	65057	373.77	-85.90	-16.20	1.411	0.848	5.006	0.884	947.8	9.217	3.010
66000	66061	373.77	-85.90	-16.41	1.342	0.846	4.761	0.883	947.8	9.217	3.010
67000	67065	373.77	-85.90	-16.96	1.277	0.844	4.528	0.882	947.8	9.217	3.010
68000	68069	373.77	-85.90	-17.51	1.214	0.842	4.307	0.881	947.8	9.217	3.010
69000	69073	373.77	-85.90	-18.05	1.155	0.840	4.096	0.881	947.8	9.217	3.010
70000	70078	373.77	-85.90	-18.60	1.098 + 0	0.838	3.896 - 3	0.880	947.8	9.217 - 6	3.010 - 6
71000	71082	373.77	-85.90	-19.15	1.045	0.836	3.705	0.879	947.8	9.217	3.010
72000	72087	373.77	-85.90	-19.70	9.936 - 1	0.834	3.524	0.878	947.8	9.217	3.010
73000	73092	373.77	-85.90	-20.25	9.450	0.832	3.352	0.877	947.8	9.217	3.010
74000	74096	373.77	-85.90	-20.80	8.988	0.830	3.188	0.876	947.8	9.217	3.010
75000	75101	373.77	-85.90	-21.35	8.548	0.827	3.032	0.875	947.8	9.217	3.010
76000	76106	373.77	-85.90	-21.90	8.130	0.825	2.883	0.874	947.8	9.217	3.010
77000	77111	373.77	-85.90	-22.44	7.732	0.823	2.742	0.873	947.8	9.217	3.010
78000	78116	373.77	-85.90	-22.99	7.354	0.821	2.608	0.871	947.8	9.217	3.010
79000	79122	373.77	-85.90	-23.54	6.994	0.818	2.481	0.870	947.8	9.217	3.010

TABLE 5.2 Continued
75° N January
GEOMETRIC ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, ft	H, ft	T, °R	t, °F	$T - T_{std}$	P, in Hg	$\frac{P}{P_{std}}$	ρ, lb ft^{-3}	$\frac{\rho}{\rho_{std}}$	C_s ft sec^{-1}	μ lb ft^{-1} sec^{-1}	k BTU ft^{-1} sec^{-1} (°R)$^{-1}$
0	0	448.59	-11.08	-70.08	2.993	+ 1	1.000	8.844 - 2	1.157	1038.3	1.072 - 5	3.566 - 6
1000	1002	450.25	-9.42	-68.88	2.870		0.995	8.491	1.138	1040.2	1.075	3.578
2000	2004	451.90	-7.77	-59.63	2.753		0.990	8.077	1.120	1042.1	1.078	3.590
3000	3006	453.56	-6.11	-54.41	2.641		0.985	7.720	1.103	1044.0	1.081	3.603
4000	4008	455.22	-4.45	-49.19	2.534		0.981	7.381	1.087	1045.9	1.085	3.615
5000	5010	456.46	-3.21	-44.38	2.432		0.977	7.064	1.072	1047.4	1.087	3.624
6000	6012	453.43	-6.24	-43.85	2.334		0.973	6.823	1.067	1043.9	1.081	3.602
7000	7013	450.39	-9.28	-43.33	2.239		0.970	6.590	1.063	1040.4	1.075	3.579
8000	8015	447.35	-12.32	-42.80	2.147		0.966	6.363	1.058	1036.9	1.069	3.557
9000	9016	444.31	-15.36	-42.28	2.059		0.962	6.142	1.054	1033.3	1.064	3.535
10000	10018	441.28	-18.39	-41.75	1.973	+ 1	0.959	5.928 - 2	1.050	1029.8	1.058 - 5	3.513 - 6
11000	11019	438.24	-21.43	-41.22	1.891		0.955	5.720	1.045	1026.2	1.052	3.491
12000	12020	435.21	-24.46	-40.69	1.811		0.952	5.517	1.041	1022.7	1.046	3.469
13000	13021	432.18	-27.49	-40.16	1.735		0.948	5.321	1.036	1019.1	1.040	3.446
14000	14022	429.16	-30.51	-39.62	1.661		0.945	5.130	1.032	1015.6	1.034	3.424
15000	15023	426.13	-33.54	-39.08	1.589		0.941	4.944	1.027	1012.0	1.028	3.402
16000	16024	423.11	-36.56	-38.55	1.521		0.938	4.765	1.023	1008.4	1.022	3.379
17000	17024	420.08	-39.59	-38.01	1.455		0.934	4.590	1.018	1004.8	1.016	3.357
18000	18025	417.06	-42.61	-37.49	1.391		0.930	4.421	1.014	1001.1	1.010	3.335
19000	19025	414.03	-45.64	-36.94	1.329		0.926	4.257	1.009	997.5	1.004	3.312
20000	20026	411.01	-48.66	-36.40	1.270	+ 1	0.923	4.097 - 2	1.005	993.8	9.979 - 6	3.290 - 6
21000	21026	407.99	-51.68	-35.87	1.214		0.919	3.943	1.000	990.2	9.919	3.267
22000	22026	404.97	-54.70	-35.33	1.159		0.916	3.793	0.996	986.5	9.858	3.245
23000	23026	401.95	-57.72	-34.79	1.106		0.913	3.648	0.992	982.8	9.797	3.222
24000	24026	398.93	-60.74	-34.25	1.056		0.909	3.508	0.987	979.1	9.736	3.200
25000	25026	395.91	-63.76	-33.71	1.007		0.906	3.372	0.983	975.4	9.674	3.177
26000	26026	392.89	-66.78	-33.18	9.603	+ 0	0.903	3.240	0.979	971.7	9.612	3.154
27000	27026	389.87	-69.80	-32.64	9.154		0.899	3.112	0.974	968.0	9.551	3.132
28000	28025	387.16	-72.51	-31.79	8.723		0.895	2.987	0.969	964.6	9.495	3.111
29000	29025	386.34	-73.33	-29.06	8.310		0.892	2.852	0.959	963.6	9.478	3.105
30000	30024	385.51	-74.16	-26.33	7.917	+ 0	0.889	2.722 - 2	0.950	962.5	9.461 - 6	3.099 - 6
31000	31023	384.69	-74.98	-23.59	7.541		0.887	2.599	0.941	961.5	9.444	3.093
32000	32023	383.87	-75.80	-20.86	7.182		0.884	2.480	0.932	960.5	9.427	3.087
33000	33022	383.05	-76.62	-18.13	6.840		0.882	2.367	0.924	959.4	9.410	3.080
34000	34021	382.22	-77.45	-15.39	6.513		0.880	2.259	0.915	958.4	9.393	3.074
35000	35020	381.40	-78.27	-12.66	6.201		0.877	2.155	0.908	957.4	9.376	3.068
36000	36019	380.58	-79.09	-9.93	5.904		0.877	2.056	0.900	956.3	9.359	3.062
37000	37017	379.76	-79.91	-10.21	5.620		0.876	1.962	0.900	955.3	9.342	3.056
38000	38016	378.94	-80.73	-11.03	5.350		0.875	1.872	0.900	954.3	9.325	3.049
39000	39015	378.11	-81.56	-11.86	5.092		0.873	1.785	0.901	953.2	9.308	3.043
40000	40013	377.29	-82.38	-12.68	4.845	+ 0	0.872	1.702 - 2	0.901	952.2	9.291 - 6	3.037 - 6
41000	41011	376.47	-83.20	-13.50	4.611		0.870	1.624	0.901	951.2	9.274	3.031
42000	42010	375.65	-84.02	-14.32	4.387		0.869	1.548	0.902	950.1	9.256	3.024
43000	43008	374.83	-84.84	-15.14	4.174		0.867	1.476	0.902	949.1	9.239	3.018
44000	44006	374.01	-85.66	-15.96	3.970		0.865	1.407	0.902	948.1	9.222	3.012
45000	45004	373.19	-86.48	-16.78	3.776		0.863	1.341	0.902	947.0	9.205	3.006
46000	46002	372.36	-87.31	-17.61	3.592		0.861	1.279	0.902	946.0	9.188	3.000
47000	47000	371.54	-88.13	-18.43	3.415		0.859	1.219	0.901	944.9	9.171	2.993
48000	47997	370.72	-88.95	-19.25	3.248		0.857	1.161	0.902	943.9	9.153	2.987
49000	48995	369.90	-89.77	-20.07	3.088		0.855	1.107	0.901	942.8	9.136	2.981
50000	49992	369.08	-90.59	-20.89	2.935	+ 0	0.852	1.054 - 2	0.900	941.8	9.119 - 6	2.975 - 6
51000	50990	368.26	-91.41	-21.71	2.790		0.850	1.004	0.900	940.7	9.102	2.968
52000	51987	367.44	-92.23	-22.53	2.652		0.847	9.568 - 3	0.899	939.7	9.085	2.962
53000	52984	366.62	-93.05	-23.35	2.520		0.845	9.113	0.899	938.6	9.067	2.956
54000	53981	365.80	-93.87	-24.17	2.395		0.842	8.679	0.898	937.6	9.050	2.950
55000	54979	364.98	-94.69	-24.99	2.275		0.839	8.265	0.896	936.5	9.033	2.943
56000	55975	364.16	-95.51	-25.81	2.162		0.836	7.870	0.895	935.5	9.015	2.937
57000	56972	363.34	-96.33	-26.63	2.054		0.833	7.492	0.894	934.4	8.998	2.931
58000	57969	362.79	-96.88	-27.18	1.991		0.830	7.127	0.892	933.7	8.986	2.927
59000	58966	362.46	-97.21	-27.51	1.853		0.827	6.776	0.890	933.3	8.979	2.924
60000	59962	362.13	-97.54	-27.84	1.759	+ 0	0.824	6.441 - 3	0.887	932.9	8.973 - 6	2.922 - 6
61000	60959	361.81	-97.86	-28.16	1.671		0.821	6.123	0.885	932.5	8.966	2.919
62000	61955	361.48	-98.19	-28.49	1.587		0.818	5.820	0.882	932.0	8.959	2.917
63000	62951	361.15	-98.52	-28.82	1.507		0.815	5.532	0.879	931.6	8.952	2.914
64000	63948	360.82	-98.85	-29.15	1.431		0.811	5.257	0.877	931.2	8.945	2.912
65000	64944	360.49	-99.18	-29.48	1.359		0.808	4.997	0.874	930.8	8.938	2.909
66000	65940	360.17	-99.50	-29.80	1.290		0.805	4.749	0.872	930.3	8.931	2.907
67000	66936	359.84	-99.83	-30.77	1.225		0.802	4.513	0.870	929.9	8.924	2.904
68000	67931	359.51	-100.16	-31.65	1.163		0.798	4.289	0.868	929.5	8.917	2.902
69000	68927	359.18	-100.49	-32.52	1.104		0.794	4.075	0.867	929.1	8.910	2.899
70000	69923	358.85	-100.82	-33.39	1.048	+ 0	0.791	3.872 - 3	0.865	928.7	8.903 - 6	2.897 - 6
71000	70918	358.53	-101.14	-34.26	9.951	- 1	0.787	3.679	0.863	928.2	8.896	2.894
72000	71914	358.20	-101.47	-35.14	9.447		0.784	3.496	0.861	927.8	8.889	2.892
73000	72909	357.87	-101.80	-36.01	8.967		0.780	3.322	0.859	927.4	8.882	2.889
74000	73904	357.54	-102.13	-36.88	8.511		0.776	3.156	0.856	927.0	8.875	2.887
75000	74899	357.22	-102.45	-37.75	8.078		0.772	2.998	0.854	926.5	8.868	2.884
76000	75894	356.89	-102.78	-38.63	7.667		0.768	2.848	0.851	926.1	8.861	2.882
77000	76889	356.56	-103.11	-39.50	7.277		0.764	2.705	0.849	925.7	8.854	2.879
78000	77884	356.23	-103.44	-40.37	6.906		0.760	2.570	0.846	925.3	8.847	2.877
79000	78879	355.91	-103.76	-41.24	6.554		0.756	2.441	0.843	924.8	8.840	2.874

TABLE 5.2 — Continued
75° N January
GEOPOTENTIAL ALTITUDE ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, ft	Z, ft	T, °R	t, °F	$T-T_{std}$	P, in Hg	$\frac{P}{P_{std}}$	ρ, lb ft^{-3}	$\frac{\rho}{\rho_{std}}$	a, ft sec^{-1}	μ, lb ft^{-1} sec^{-1}	k, BTU ft^{-1} sec^{-1} °R^{-1}
80000	80127	373.77	-85.90	-24.08	4.652 - 1	0.816	2.359 - 3	0.868	947.8	9.217 - 6	3.010 - 6
81000	81133	373.77	-85.90	-24.64	4.527	0.813	2.244	0.867	947.8	9.217	3.010
82000	82138	373.77	-85.90	-25.19	4.017	0.811	2.134	0.865	947.8	9.217	3.010
83000	83144	373.77	-85.90	-25.74	5.723	0.808	2.030	0.864	947.8	9.217	3.010
84000	84150	373.77	-85.90	-26.28	5.443	0.805	1.931	0.862	947.8	9.217	3.010
85000	85155	373.77	-85.90	-26.83	5.177	0.803	1.836	0.860	947.8	9.217	3.010
86000	86161	373.77	-85.90	-27.38	4.924	0.800	1.746	0.859	947.8	9.217	3.010
87000	87167	373.77	-85.90	-27.93	4.683	0.797	1.661	0.857	947.8	9.217	3.010
88000	88174	373.77	-85.90	-28.48	4.454	0.794	1.580	0.855	947.8	9.217	3.010
89000	89180	373.77	-85.90	-29.03	4.236	0.792	1.502	0.853	947.8	9.217	3.010
90000	90186	373.77	-85.90	-29.58	4.029 - 1	0.789	1.429 - 3	0.851	947.8	9.217 - 6	3.010 - 6
91000	91193	373.77	-85.90	-30.12	3.832	0.786	1.359	0.849	947.8	9.217	3.010
92000	92199	373.77	-85.90	-30.67	3.644	0.783	1.293	0.847	947.8	9.217	3.010
93000	93206	373.77	-85.90	-31.22	3.466	0.780	1.229	0.845	947.8	9.217	3.010
94000	94213	373.77	-85.90	-31.77	3.297	0.777	1.169	0.843	947.8	9.217	3.010
95000	95219	373.77	-85.90	-32.32	3.135	0.774	1.112	0.841	947.8	9.217	3.010
96000	96226	373.77	-85.90	-32.87	2.982	0.771	1.058	0.839	947.8	9.217	3.010
97000	97233	373.77	-85.90	-33.42	2.836	0.768	1.006	0.838	947.8	9.217	3.010
98000	98240	373.77	-85.90	-33.97	2.698	0.764	9.567 - 4	0.834	947.8	9.217	3.010

Table 5.2 — *Continued*

75° N January

GEOMETRIC ALTITUDE ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, ft	H, ft	T, °R	t, °F	$T - T_{std}$	P, in. Hg	$\frac{P}{P_{std}}$	ρ, lb/ft³	$\frac{\rho}{\rho_{std}}$	C, ft/sec	μ, lb/ft-sec	k, BTU/ft-sec-°R
80000	79874	373.77	-85.90	-23.92	6.695 - 1	0.809	2.379 - 3	0.861	947.8	9.217 - 6	3.010 - 6
81000	80868	373.77	-85.90	-24.47	6.369	0.807	2.259	0.860	947.8	9.217	3.010
82000	81863	373.77	-85.90	-25.01	6.059	0.804	2.144	0.858	947.8	9.217	3.010
83000	82857	373.77	-85.90	-25.56	5.764	0.801	2.044	0.856	947.8	9.217	3.010
84000	83851	373.77	-85.90	-26.10	5.484	0.799	1.945	0.855	947.8	9.217	3.010
85000	84845	373.77	-85.90	-26.64	5.217	0.796	1.850	0.853	947.8	9.217	3.010
86000	85840	373.77	-85.90	-27.19	4.964	0.793	1.760	0.851	947.8	9.217	3.010
87000	86834	373.77	-85.90	-27.73	4.722	0.791	1.675	0.849	947.8	9.217	3.010
88000	87827	373.77	-85.90	-28.28	4.493	0.788	1.593	0.848	947.8	9.217	3.010
89000	88821	373.77	-85.90	-28.82	4.274	0.785	1.516	0.845	947.8	9.217	3.010
90000	89815	373.77	-85.90	-29.36	4.066 - 1	0.782	1.442 - 3	0.843	947.8	9.217 - 6	3.010 - 6
91000	90809	373.77	-85.90	-29.91	3.869	0.779	1.372	0.841	947.8	9.217	3.010
92000	91802	373.77	-85.90	-30.45	3.681	0.776	1.305	0.840	947.8	9.217	3.010
93000	92796	373.77	-85.90	-31.00	3.502	0.773	1.242	0.837	947.8	9.217	3.010
94000	93789	373.77	-85.90	-31.54	3.332	0.770	1.182	0.835	947.8	9.217	3.010
95000	94782	373.77	-85.90	-32.08	3.170	0.767	1.124	0.833	947.8	9.217	3.010
96000	95775	373.77	-85.90	-32.63	3.016	0.764	1.070	0.830	947.8	9.217	3.010
97000	96768	373.77	-85.90	-33.17	2.869	0.761	1.018	0.828	947.8	9.217	3.010
98000	97761	373.77	-85.90	-33.71	2.730	0.757	9.682 - 4	0.826	947.8	9.217	3.010

TABLE 5.2 – Continued

75° N January (Cold)

GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, ft	Z, ft	T, °R	t, °F	$T - T_{std}$	P, in Hg	$\frac{P}{P_{std}}$	ρ, lb ft^{-3}	$\frac{\rho}{\rho_{std}}$	a, ft sec^{-1}	μ, lb ft^{-1} sec^{-1}	k, Btu ft^{-1} sec^{-1} (°R)$^{-1}$
0	0	448.59	-11.08	-70.08	2.993 + 1	1.000	8.844 - 2	1.157	1038.3	1.072 - 5	1.586 - 6
1000	998	450.24	-9.43	-66.68	2.871	0.995	8.452	1.138	1040.2	1.075	3.578
2000	1996	451.90	-7.77	-59.64	2.754	0.990	8.078	1.120	1042.1	1.078	3.590
3000	2994	453.55	-6.12	-54.42	2.642	0.985	7.722	1.104	1044.0	1.081	3.602
4000	3992	455.21	-4.46	-49.20	2.535	0.981	7.383	1.087	1045.9	1.085	3.615
5000	4990	456.49	-3.18	-44.34	2.433	0.977	7.066	1.072	1047.4	1.087	3.624
6000	5988	458.46	-6.21	-43.81	2.335	0.974	6.826	1.068	1048.9	1.081	3.602
7000	6987	460.43	-9.24	-43.28	2.240	0.970	6.593	1.064	1040.4	1.075	3.580
8000	7985	447.39	-12.28	-42.75	2.149	0.967	6.366	1.059	1036.9	1.070	3.558
9000	8984	444.36	-15.31	-42.21	2.060	0.963	6.146	1.055	1033.4	1.064	3.536
10000	9982	441.33	-18.34	-41.68	1.975 + 1	0.960	5.932 - 2	1.050	1029.9	1.058 - 5	3.513 - 6
11000	10981	438.30	-21.37	-41.14	1.892	0.956	5.723	1.046	1026.3	1.052	3.491
12000	11980	435.27	-24.40	-40.60	1.813	0.953	5.521	1.042	1022.8	1.046	3.469
13000	12979	432.25	-27.42	-40.06	1.736	0.949	5.325	1.037	1019.2	1.040	3.447
14000	13978	429.22	-30.45	-39.52	1.662	0.946	5.134	1.033	1015.6	1.034	3.425
15000	14977	426.20	-33.47	-38.98	1.591	0.943	4.949	1.028	1012.0	1.028	3.402
16000	15976	423.18	-36.49	-38.43	1.522	0.939	4.769	1.024	1008.5	1.022	3.380
17000	16976	420.16	-39.51	-37.89	1.456	0.935	4.594	1.020	1004.8	1.016	3.358
18000	17975	417.13	-42.54	-37.35	1.392	0.932	4.425	1.015	1001.2	1.010	3.335
19000	18975	414.11	-45.56	-36.80	1.331	0.928	4.261	1.011	997.6	1.004	3.313
20000	19974	411.09	-48.58	-36.26	1.272 + 1	0.925	4.101 - 2	1.006	993.9	9.981 - 6	3.290 - 6
21000	20974	408.07	-51.60	-35.71	1.215	0.922	3.947	1.002	990.3	9.920	3.268
22000	21974	405.05	-54.62	-35.17	1.160	0.918	3.797	0.998	986.6	9.859	3.245
23000	22974	402.03	-57.64	-34.62	1.108	0.915	3.652	0.993	982.9	9.798	3.223
24000	23974	399.01	-60.66	-34.07	1.057	0.911	3.511	0.989	979.2	9.737	3.200
25000	24974	395.99	-63.68	-33.53	1.008	0.908	3.375	0.985	975.5	9.676	3.178
26000	25974	392.97	-66.70	-32.98	9.615 + 0	0.904	3.243	0.980	971.8	9.614	3.155
27000	26974	389.95	-69.72	-32.44	9.165	0.901	3.116	0.976	968.0	9.552	3.132
28000	27975	387.18	-72.49	-31.64	8.733	0.898	2.990	0.971	964.6	9.495	3.112
29000	28975	386.96	-73.31	-28.90	8.320	0.895	2.855	0.962	963.6	9.478	3.105
30000	29976	385.53	-74.14	-26.15	7.926 + 0	0.892	2.725 - 2	0.953	962.6	9.461 - 6	3.099 - 6
31000	30977	384.71	-74.96	-23.41	7.549	0.889	2.601	0.944	961.5	9.444	3.093
32000	31977	383.89	-75.78	-20.67	7.190	0.887	2.483	0.935	960.5	9.427	3.087
33000	32978	383.06	-76.61	-17.92	6.847	0.885	2.369	0.926	959.5	9.410	3.081
34000	33979	382.24	-77.43	-15.18	6.520	0.883	2.261	0.918	958.4	9.393	3.074
35000	34980	381.42	-78.25	-12.44	6.207	0.882	2.157	0.910	957.4	9.376	3.068
36000	35981	380.60	-79.07	-9.69	5.909	0.880	2.058	0.903	956.4	9.359	3.062
37000	36983	379.77	-79.90	-10.20	5.625	0.879	1.964	0.903	955.3	9.342	3.056
38000	37984	378.95	-80.72	-11.02	5.354	0.878	1.873	0.904	954.3	9.325	3.049
39000	38985	378.13	-81.54	-11.84	5.095	0.877	1.786	0.904	953.3	9.308	3.043
40000	39987	377.30	-82.37	-12.67	4.849 + 0	0.876	1.704 - 2	0.905	952.2	9.291 - 6	3.037 - 6
41000	40989	376.48	-83.19	-13.49	4.613	0.874	1.624	0.905	951.2	9.274	3.031
42000	41990	375.66	-84.01	-14.31	4.389	0.873	1.549	0.906	950.1	9.257	3.025
43000	42992	374.83	-84.84	-15.14	4.175	0.871	1.477	0.906	949.1	9.239	3.018
44000	43994	374.01	-85.66	-15.96	3.971	0.869	1.408	0.906	948.1	9.222	3.012
45000	44996	373.19	-86.48	-16.78	3.777	0.867	1.342	0.907	947.0	9.205	3.006
46000	45998	372.37	-87.30	-17.60	3.592	0.865	1.279	0.906	946.0	9.188	3.000
47000	47000	371.54	-88.13	-18.43	3.415	0.863	1.219	0.906	944.9	9.171	2.993
48000	48003	370.72	-88.95	-19.25	3.247	0.861	1.161	0.906	943.9	9.153	2.987
49000	49005	369.90	-89.77	-20.07	3.087	0.859	1.106	0.905	942.8	9.136	2.981
50000	50008	369.07	-90.60	-20.90	2.934 + 0	0.857	1.054 - 2	0.905	941.8	9.119 - 6	2.975 - 6
51000	51010	368.25	-91.42	-21.72	2.789	0.854	1.004	0.904	940.7	9.102	2.968
52000	52013	367.43	-92.24	-22.54	2.650	0.852	9.562 - 3	0.905	939.7	9.084	2.962
53000	53016	366.60	-93.07	-23.37	2.518	0.849	9.106	0.903	938.6	9.067	2.956
54000	54019	365.78	-93.89	-24.19	2.393	0.847	8.671	0.903	937.6	9.050	2.950
55000	55022	364.96	-94.71	-25.01	2.273	0.844	8.256	0.902	936.5	9.032	2.943
56000	56025	364.14	-95.53	-25.83	2.159	0.841	7.860	0.901	935.5	9.015	2.937
57000	57028	363.31	-96.36	-26.66	2.051	0.838	7.482	0.900	934.4	8.998	2.931
58000	58031	362.78	-96.89	-27.19	1.947	0.835	7.116	0.898	933.7	8.986	2.927
59000	59034	362.45	-97.22	-27.52	1.849	0.832	6.764	0.895	933.3	8.979	2.924
60000	60038	362.12	-97.55	-27.85	1.756 + 0	0.829	6.429 - 3	0.893	932.9	8.972 - 6	2.922 - 6
61000	61041	361.79	-97.88	-28.18	1.667	0.826	6.110	0.890	932.4	8.965	2.919
62000	62045	361.46	-98.21	-28.51	1.583	0.823	5.806	0.888	932.0	8.958	2.917
63000	63049	361.13	-98.54	-28.84	1.503	0.820	5.518	0.885	931.6	8.951	2.914
64000	64053	360.80	-98.87	-29.17	1.427	0.817	5.243	0.883	931.2	8.944	2.912
65000	65057	360.47	-99.20	-29.50	1.355	0.814	4.982	0.880	930.7	8.937	2.909
66000	66061	360.15	-99.52	-30.03	1.286	0.810	4.734	0.878	930.3	8.930	2.907
67000	67065	359.82	-99.85	-30.91	1.221	0.807	4.498	0.876	929.9	8.923	2.904
68000	68069	359.49	-100.18	-31.79	1.159	0.804	4.274	0.875	929.5	8.916	2.902
69000	69073	359.16	-100.51	-32.67	1.100	0.800	4.060	0.873	929.0	8.909	2.899
70000	70078	358.83	-100.84	-33.55	1.044 + 0	0.797	3.857 - 3	0.871	928.6	8.902 - 6	2.897 - 6
71000	71082	358.50	-101.17	-34.42	9.909 - 1	0.793	3.664	0.869	928.2	8.895	2.894
72000	72087	358.17	-101.50	-35.30	9.404	0.790	3.481	0.867	927.8	8.888	2.892
73000	73092	357.84	-101.83	-36.18	8.924	0.786	3.308	0.865	927.3	8.881	2.889
74000	74096	357.51	-102.16	-37.06	8.469	0.782	3.140	0.863	926.9	8.874	2.887
75000	75101	357.18	-102.49	-37.94	8.036	0.778	2.982	0.861	926.5	8.867	2.884
76000	76106	356.85	-102.82	-38.81	7.625	0.774	2.833	0.858	926.1	8.860	2.882
77000	77111	356.52	-103.15	-39.69	7.235	0.770	2.690	0.856	925.6	8.853	2.879
78000	78116	356.20	-103.47	-40.57	6.864	0.766	2.555	0.853	925.2	8.846	2.877
79000	79122	355.87	-103.80	-41.45	6.512	0.762	2.426	0.851	924.8	8.839	2.874

TABLE 5.2 — *Continued*

75° N January (Cold)

GEOMETRIC ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, ft	H, ft	T, °R	t, °F	$T - T_{std}$	P, in Hg	$\frac{P}{P_{std}}$	ρ, lb ft^{-3}	$\frac{\rho}{\rho_{std}}$	C_s, ft sec^{-1}	μ, lb ft^{-1} sec^{-1}	k, BTU ft sec^{-1} °R^{-1}
0	0	448.59	-11.08	-70.08	2.993	+ 1	1.000	8.844 - 2	1.157	1038.3	1.072 - 5	3.586 - 6
1000	1002	450.25	-9.42	-68.86	2.870		0.995	8.451	1.138	1040.2	1.075	3.578
2000	2004	451.90	-7.77	-59.63	2.753		0.990	8.077	1.120	1042.1	1.078	3.590
3000	3006	453.56	-6.11	-58.41	2.641		0.985	7.720	1.103	1044.0	1.081	3.603
4000	4008	455.22	-4.45	-69.19	2.534		0.981	7.381	1.087	1045.9	1.085	3.615
5000	5010	456.46	-3.21	-68.38	2.432		0.977	7.064	1.072	1047.4	1.087	3.624
6000	6012	458.43	-6.24	-68.85	2.334		0.973	6.823	1.067	1045.9	1.081	3.602
7000	7013	460.39	-9.28	-68.33	2.239		0.970	6.590	1.063	1040.4	1.079	3.579
8000	8015	462.35	-12.32	-62.80	2.147		0.966	6.363	1.058	1038.9	1.069	3.557
9000	9016	464.31	-15.36	-62.28	2.059		0.962	6.142	1.054	1033.3	1.064	3.535
10000	10018	461.28	-18.39	-61.75	1.973	+ 1	0.959	5.928 - 2	1.050	1029.8	1.058 - 5	3.513 - 6
11000	11019	438.24	-21.43	-61.22	1.891		0.955	5.720	1.045	1026.2	1.052	3.491
12000	12020	435.21	-24.46	-60.69	1.811		0.952	5.517	1.041	1022.7	1.046	3.469
13000	13021	432.18	-27.49	-60.16	1.735		0.948	5.321	1.036	1019.1	1.040	3.446
14000	14022	429.16	-30.51	-59.62	1.661		0.945	5.130	1.032	1015.6	1.034	3.424
15000	15023	426.13	-33.54	-59.08	1.589		0.941	4.944	1.027	1012.0	1.028	3.402
16000	16024	423.11	-36.56	-58.55	1.521		0.938	4.765	1.023	1008.4	1.022	3.379
17000	17024	420.08	-39.59	-58.01	1.455		0.934	4.590	1.018	1004.8	1.016	3.357
18000	18025	417.06	-42.61	-57.48	1.391		0.930	4.421	1.014	1001.1	1.010	3.335
19000	19025	414.03	-45.64	-56.94	1.329		0.926	4.257	1.009	997.5	1.004	3.312
20000	20026	411.01	-48.66	-56.40	1.270	+ 1	0.923	4.097 - 2	1.005	993.8	9.979 - 6	3.290 - 6
21000	21026	407.99	-51.68	-55.87	1.214		0.919	3.943	1.000	990.2	9.919	3.267
22000	22026	404.97	-54.70	-55.33	1.159		0.916	3.793	0.996	986.5	9.858	3.245
23000	23026	401.95	-57.72	-54.79	1.106		0.913	3.648	0.992	982.8	9.797	3.222
24000	24026	398.93	-60.74	-54.25	1.056		0.909	3.508	0.987	979.1	9.736	3.200
25000	25026	395.91	-63.76	-53.71	1.007		0.906	3.372	0.983	975.4	9.674	3.177
26000	26026	392.89	-66.78	-53.18	9.603	+ 0	0.903	3.240	0.979	971.7	9.612	3.154
27000	27026	389.87	-69.80	-52.64	9.154		0.899	3.112	0.974	968.0	9.551	3.132
28000	28025	387.23	-72.44	-51.72	8.723		0.895	2.986	0.969	964.7	9.496	3.112
29000	29025	386.96	-72.71	-28.44	8.311		0.892	2.867	0.958	964.3	9.491	3.110
30000	30024	386.69	-72.98	-25.15	7.916	+ 0	0.889	2.714 - 2	0.947	964.0	9.485 - 6	3.108 - 6
31000	31023	386.41	-73.26	-21.87	7.543		0.887	2.588	0.937	963.6	9.479	3.106
32000	32023	386.14	-73.53	-18.59	7.186		0.885	2.467	0.927	963.3	9.474	3.104
33000	33022	385.86	-73.81	-15.31	6.846		0.883	2.352	0.918	963.0	9.468	3.102
34000	34021	385.59	-74.08	-12.03	6.522		0.881	2.242	0.908	962.6	9.463	3.100
35000	35020	385.32	-74.35	-8.75	6.212		0.880	2.137	0.900	962.3	9.457	3.097
36000	36019	385.04	-74.63	-5.47	5.918		0.879	2.037	0.892	961.9	9.451	3.095
37000	37017	384.77	-74.90	-5.20	5.637		0.878	1.942	0.890	961.6	9.446	3.093
38000	38016	384.45	-75.22	-5.52	5.369		0.878	1.851	0.890	961.2	9.439	3.091
39000	39015	384.01	-75.66	-5.96	5.114		0.877	1.765	0.891	960.6	9.430	3.088
40000	40013	383.57	-76.10	-6.40	4.870	+ 0	0.876	1.683 - 2	0.891	960.1	9.421 - 6	3.084 - 6
41000	41011	383.13	-76.54	-6.84	4.638		0.875	1.605	0.891	959.5	9.412	3.081
42000	42010	382.69	-76.98	-7.28	4.417		0.874	1.530	0.891	959.0	9.403	3.078
43000	43008	382.26	-77.41	-7.71	4.206		0.874	1.459	0.891	958.5	9.394	3.074
44000	44006	381.82	-77.85	-8.15	4.005		0.873	1.391	0.891	957.9	9.385	3.071
45000	45004	381.38	-78.29	-8.59	3.814		0.872	1.326	0.891	957.4	9.376	3.068
46000	46002	380.94	-78.73	-9.03	3.631		0.871	1.264	0.891	956.8	9.366	3.064
47000	47000	380.50	-79.17	-9.47	3.457		0.869	1.204	0.891	956.3	9.357	3.061
48000	47997	380.07	-79.60	-9.90	3.291		0.868	1.148	0.891	955.7	9.348	3.054
49000	48995	379.63	-80.04	-10.34	3.133		0.867	1.094	0.891	955.2	9.339	3.055
50000	49992	379.19	-80.48	-10.78	2.982	+ 0	0.866	1.043 - 2	0.890	954.6	9.330 - 6	3.051 - 6
51000	50990	378.75	-80.92	-11.22	2.839		0.864	9.936 - 3	0.890	954.0	9.321	3.048
52000	51987	378.31	-81.36	-11.66	2.702		0.863	9.468	0.890	953.5	9.312	3.045
53000	52984	377.88	-81.79	-12.09	2.572		0.862	9.022	0.890	952.9	9.303	3.041
54000	53981	377.44	-82.23	-12.53	2.448		0.860	8.598	0.889	952.4	9.294	3.038
55000	54979	377.00	-82.67	-12.97	2.329		0.859	8.195	0.888	951.8	9.285	3.035
56000	55975	376.56	-83.11	-13.41	2.217		0.857	7.803	0.888	951.3	9.276	3.031
57000	56972	376.13	-83.54	-13.84	2.109		0.856	7.434	0.887	950.7	9.266	3.028
58000	57969	375.69	-83.98	-14.28	2.007		0.854	7.081	0.887	950.2	9.257	3.025
59000	58966	375.25	-84.42	-14.72	1.909		0.852	6.746	0.886	949.6	9.248	3.021
60000	59962	374.81	-84.86	-15.16	1.817	+ 0	0.851	6.425 - 3	0.885	949.1	9.239 - 6	3.018 - 6
61000	60959	374.38	-85.29	-15.59	1.728		0.849	6.120	0.884	948.5	9.230	3.015
62000	61955	373.94	-85.73	-16.03	1.644		0.847	5.829	0.884	948.0	9.221	3.012
63000	62951	373.77	-85.90	-16.20	1.564		0.845	5.547	0.882	947.8	9.217	3.010
64000	63948	373.77	-85.90	-16.20	1.488		0.843	5.277	0.880	947.8	9.217	3.010
65000	64944	373.77	-85.90	-16.20	1.415		0.841	5.020	0.878	947.8	9.217	3.010
66000	65940	373.77	-85.90	-16.20	1.346		0.840	4.775	0.877	947.8	9.217	3.010
67000	66936	373.77	-85.90	-16.84	1.281		0.838	4.543	0.876	947.8	9.217	3.010
68000	67931	373.77	-85.90	-17.38	1.218		0.836	4.321	0.875	947.8	9.217	3.010
69000	68927	373.77	-85.90	-17.93	1.159		0.834	4.111	0.874	947.8	9.217	3.010
70000	69923	373.77	-85.90	-18.47	1.103	+ 0	0.832	3.911 - 3	0.873	947.8	9.217 - 6	3.010 - 6
71000	70918	373.77	-85.90	-19.02	1.049		0.830	3.720	0.872	947.8	9.217	3.010
72000	71914	373.77	-85.90	-19.56	9.979	- 1	0.828	3.539	0.871	947.8	9.217	3.010
73000	72909	373.77	-85.90	-20.11	9.493		0.825	3.367	0.870	947.8	9.217	3.010
74000	73904	373.77	-85.90	-20.65	9.031		0.823	3.203	0.869	947.8	9.217	3.010
75000	74899	373.77	-85.90	-21.20	8.591		0.821	3.047	0.868	947.8	9.217	3.010
76000	75894	373.77	-85.90	-21.74	8.173		0.819	2.899	0.867	947.8	9.217	3.010
77000	76889	373.77	-85.90	-22.29	7.775		0.817	2.758	0.865	947.8	9.217	3.010
78000	77884	373.77	-85.90	-22.83	7.397		0.814	2.623	0.864	947.8	9.217	3.010
79000	78879	373.77	-85.90	-23.38	7.037		0.812	2.496	0.862	947.8	9.217	3.010

TABLE 5.2 – *Continued*
75° N. January (Cold)
GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, ft	Z, ft	T, °R	t, °F	$T-T_{std}$	P, in. Hg	$\frac{P}{P_{std}}$	ρ, lb ft^{-3}	$\frac{\rho}{\rho_{std}}$	C_s, ft sec^{-1}	μ, lb ft^{-1} sec^{-1}	k, BTU ft^{-1} sec^{-1} (°R)$^{-1}$
80000	80127	355.94	-104.13	-42.32	8.178 - 1	0.758	2.303 - 3	0.848	924.3	8.832 - 6	2.871 - 6
81000	81133	355.21	-104.46	-43.20	5.860	0.753	2.187	0.845	923.9	8.825	2.869
82000	82138	354.88	-104.79	-44.06	5.559	0.749	2.077	0.842	923.5	8.818	2.866
83000	83144	354.87	-105.80	-44.44	5.273	0.745	1.970	0.838	923.5	8.818	2.866
84000	84150	354.87	-104.80	-45.18	5.002	0.740	1.868	0.834	923.5	8.818	2.866
85000	85155	354.87	-104.80	-45.73	4.744	0.736	1.772	0.830	923.5	8.818	2.866
86000	86161	354.87	-104.80	-46.28	4.500	0.731	1.681	0.826	923.5	8.818	2.866
87000	87167	354.87	-104.80	-46.83	4.269	0.727	1.595	0.823	923.5	8.818	2.866
88000	88174	354.87	-104.80	-47.38	4.049	0.722	1.513	0.819	923.5	8.818	2.866
89000	89180	354.87	-104.80	-47.93	3.841	0.718	1.435	0.815	923.5	8.818	2.866
90000	90186	354.87	-104.80	-48.48	3.643 - 1	0.713	1.361 - 3	0.811	923.5	8.818 - 6	2.866 - 6
91000	91193	354.87	-104.80	-49.02	3.456	0.709	1.291	0.807	923.5	8.818	2.866
92000	92199	354.87	-104.80	-49.57	3.278	0.704	1.225	0.802	923.5	8.818	2.866
93000	93206	354.87	-104.80	-50.12	3.109	0.700	1.162	0.798	923.5	8.818	2.866
94000	94213	354.87	-104.80	-50.67	2.949	0.695	1.102	0.794	923.5	8.818	2.866
95000	95219	354.87	-104.80	-51.22	2.798	0.690	1.045	0.790	923.5	8.818	2.866
96000	96226	354.87	-104.80	-51.77	2.654	0.686	9.913 - 4	0.786	923.5	8.818	2.866
97000	97233	354.87	-104.80	-52.32	2.517	0.681	9.403	0.782	923.5	8.818	2.866
98000	98240	354.87	-104.80	-52.87	2.388	0.677	8.919	0.778	923.5	8.818	2.866

TABLE 5.2.—*Continued*
75° N. January (Cold)
GEOMETRIC ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, ft	H, ft	T, °R	t, °F	$T-T_{std}$	P, in. Hg	$\frac{P}{P_{std}}$	ρ, lb ft^{-3}	$\frac{\rho}{\rho_{std}}$	C_s, ft sec^{-1}	μ, lb ft^{-1} sec^{-1}	k, BTU ft^{-1} sec^{-1} (°R)$^{-1}$
80000	79874	355.58	-104.09	-42.11	6.219 − 1	0.752	2.319 − 3	0.841	924.4	8.833 − 6	2.872 − 6
81000	80868	355.25	-104.42	-42.99	5.901	0.747	2.202	0.838	924.0	8.826	2.869
82000	81863	354.92	-104.75	-43.86	5.599	0.743	2.091	0.835	923.6	8.819	2.867
83000	82857	354.87	-104.80	-44.46	5.313	0.739	1.985	0.831	923.5	8.818	2.866
84000	83851	354.87	-104.80	-45.00	5.041	0.734	1.883	0.827	923.5	8.818	2.866
85000	84845	354.87	-104.80	-45.54	4.783	0.730	1.787	0.823	923.5	8.818	2.866
86000	85840	354.87	-104.80	-46.09	4.539	0.725	1.695	0.820	923.5	8.818	2.866
87000	86834	354.87	-104.80	-46.63	4.306	0.721	1.609	0.816	923.5	8.818	2.866
88000	87827	354.87	-104.80	-47.18	4.086	0.716	1.526	0.812	923.5	8.818	2.866
89000	88821	354.87	-104.80	-47.72	3.877	0.712	1.448	0.808	923.5	8.818	2.866
90000	89815	354.87	-104.80	-48.26	3.679 − 1	0.707	1.374 − 3	0.804	923.5	8.818 − 6	2.866 − 6
91000	90809	354.87	-104.80	-48.81	3.491	0.703	1.304	0.800	923.5	8.818	2.866
92000	91802	354.87	-104.80	-49.35	3.312	0.698	1.237	0.796	923.5	8.818	2.866
93000	92796	354.87	-104.80	-49.90	3.143	0.694	1.174	0.791	923.5	8.818	2.866
94000	93789	354.87	-104.80	-50.44	2.982	0.689	1.114	0.787	923.5	8.818	2.866
95000	94782	354.87	-104.80	-50.98	2.830	0.685	1.057	0.783	923.5	8.818	2.866
96000	95775	354.87	-104.80	-51.53	2.685	0.680	1.003	0.779	923.5	8.818	2.866
97000	96768	354.87	-104.80	-52.07	2.548	0.676	9.519 − 4	0.775	923.5	8.818	2.866
98000	97761	354.87	-104.80	-52.61	2.418	0.671	9.033	0.771	923.5	8.818	2.866

TABLE 5.2.—*Continued*
75° N. January (Warm)
GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, ft	Z, ft	T, °R	t, °F	$T - T_{std}$	P, in. Hg	$\frac{P}{P_{std}}$	ρ, lb ft^{-3}	$\frac{\rho}{\rho_{std}}$	C, ft sec^{-1}	μ, lb ft^{-1} sec^{-1}	k, BTU ft^{-1} sec^{-1} °R^{-1}
0	0	448.59	-11.08	-70.08	2.993	1.000	8.844 − 4	1.157	1038.3	1.072 − 5	3.566 − 6
1000	998	450.24	-9.43	-69.66	2.871	0.995	8.452	1.138	1040.2	1.075	3.578
2000	1996	451.90	-7.77	-69.24	2.754	0.990	8.078	1.120	1042.1	1.078	3.590
3000	2994	453.55	-6.12	-68.82	2.642	0.985	7.722	1.104	1044.0	1.081	3.602
4000	3992	455.21	-4.46	-68.40	2.535	0.981	7.383	1.087	1045.9	1.085	3.615
5000	4990	456.87	-2.80	-67.98	2.433	0.977	7.060	1.072	1047.8	1.087	3.624
6000	5988	458.46	-1.21	-67.57	2.335	0.973	6.752	1.058	1049.7	1.091	3.637
7000	6987	460.13	+0.46	-67.15	2.240	0.970	6.459	1.044	1051.6	1.094	3.650
8000	7985	461.79	+2.12	-66.73	2.149	0.967	6.180	1.031	1053.5	1.098	3.663
9000	8984	463.44	+3.77	-66.31	2.060	0.963	5.914	1.019	1055.4	1.101	3.676
10000	9982	465.10	+5.43	-65.89	1.975	1.000	5.661 − 4	1.007	1057.3	1.105 − 5	3.689 − 6
11000	10981	466.75	+7.08	-65.47	1.892	0.996	5.420	0.995	1059.2	1.108	3.702
12000	11980	468.41	+8.74	-65.05	1.813	0.993	5.191	0.983	1061.1	1.112	3.715
13000	12979	470.06	+10.39	-64.64	1.736	0.989	4.973	0.971	1063.0	1.115	3.728
14000	13978	471.72	+12.05	-64.22	1.662	0.986	4.765	0.959	1064.9	1.119	3.741
15000	14977	473.37	+13.70	-63.80	1.591	0.983	4.566	0.948	1066.8	1.122	3.754
16000	15976	475.03	+15.36	-63.38	1.522	0.979	4.377	0.936	1068.7	1.126	3.767
17000	16976	476.68	+17.01	-62.96	1.456	0.976	4.196	0.925	1070.6	1.129	3.780
18000	17975	478.34	+18.67	-62.54	1.392	0.973	4.024	0.914	1072.5	1.133	3.793
19000	18975	479.99	+20.32	-62.13	1.331	0.970	3.860	0.903	1074.4	1.136	3.806
20000	19974	481.65	+21.98	-61.71	1.272	1.000	3.703 − 4	0.893	1076.3	1.140 − 5	3.819 − 6
21000	20974	483.30	+23.63	-61.29	1.215	0.997	3.553	0.883	1078.2	1.143	3.832
22000	21974	484.96	+25.29	-60.87	1.161	0.994	3.410	0.873	1080.1	1.147	3.845
23000	22974	486.61	+26.94	-60.45	1.109	0.991	3.273	0.863	1082.0	1.150	3.858
24000	23974	488.27	+28.60	-60.03	1.059	0.988	3.142	0.853	1083.9	1.154	3.871
25000	24974	489.92	+30.25	-59.62	1.011	0.985	3.017	0.843	1085.8	1.157	3.884
26000	25974	491.58	+31.91	-59.20	9.655	0.982	2.897	0.833	1087.7	1.161	3.897
27000	26974	493.23	+33.56	-58.78	9.220	0.979	2.782	0.824	1089.6	1.164	3.910
28000	27975	494.89	+35.22	-58.36	8.806	0.976	2.672	0.814	1091.5	1.168	3.923
29000	28975	496.54	+36.87	-57.94	8.412	0.973	2.567	0.805	1093.4	1.171	3.936
30000	29976	498.20	+38.53	-57.52	8.037	1.000	2.467 − 4	0.796	1095.3	1.175 − 5	3.949 − 6
31000	30977	499.85	+40.18	-57.10	7.680	0.997	2.371	0.787	1097.2	1.178	3.962
32000	31977	501.51	+41.84	-56.68	7.340	0.994	2.280	0.778	1099.1	1.182	3.975
33000	32978	503.16	+43.49	-56.26	7.017	0.991	2.193	0.769	1101.0	1.185	3.988
34000	33979	504.82	+45.15	-55.84	6.709	0.988	2.110	0.760	1102.9	1.189	4.001
35000	34980	506.47	+46.80	-55.42	6.416	0.985	2.031	0.751	1104.8	1.192	4.014
36000	35981	508.13	+48.46	-55.00	6.137	0.982	1.956	0.743	1106.7	1.196	4.027
37000	36983	509.78	+50.11	-54.58	5.871	0.979	1.884	0.734	1108.6	1.199	4.040
38000	37984	511.44	+51.77	-54.16	5.618	0.976	1.815	0.726	1110.5	1.203	4.053
39000	38985	513.09	+53.42	-53.74	5.377	0.973	1.750	0.718	1112.4	1.206	4.066
40000	39987	514.75	+55.08	-53.32	5.147	1.000	1.687 − 4	0.710	1114.3	1.210 − 5	4.079 − 6
41000	40989	516.40	+56.73	-52.90	4.928	0.997	1.627	0.702	1116.2	1.213	4.092
42000	41990	518.06	+58.39	-52.48	4.719	0.994	1.569	0.694	1118.1	1.217	4.105
43000	42992	519.71	+60.04	-52.06	4.520	0.991	1.514	0.686	1120.0	1.220	4.118
44000	43994	521.37	+61.70	-51.64	4.331	0.988	1.461	0.678	1121.9	1.224	4.131
45000	44996	523.02	+63.35	-51.22	4.151	0.985	1.410	0.670	1123.8	1.227	4.144
46000	45998	524.68	+65.01	-50.80	3.979	0.982	1.361	0.662	1125.7	1.231	4.157
47000	47000	526.33	+66.66	-50.38	3.816	0.979	1.314	0.655	1127.6	1.234	4.170
48000	48003	527.99	+68.32	-49.96	3.661	0.976	1.269	0.647	1129.5	1.238	4.183
49000	49005	529.64	+69.97	-49.54	3.513	0.973	1.225	0.640	1131.4	1.241	4.196
50000	50008	531.30	+71.63	-49.12	3.372	1.000	1.183 − 4	0.633	1133.3	1.245 − 5	4.209 − 6
51000	51010	532.95	+73.28	-48.70	3.237	0.997	1.143	0.625	1135.2	1.248	4.222
52000	52013	534.61	+74.94	-48.28	3.108	0.994	1.104	0.618	1137.1	1.252	4.235
53000	53016	536.26	+76.59	-47.86	2.984	0.991	1.067	0.611	1139.0	1.255	4.248
54000	54019	537.92	+78.25	-47.44	2.866	0.988	1.031	0.604	1140.9	1.259	4.261
55000	55022	539.57	+79.90	-47.02	2.753	0.985	9.964 − 5	0.597	1142.8	1.262	4.274
56000	56025	541.23	+81.56	-46.60	2.644	0.982	9.629	0.590	1144.7	1.266	4.287
57000	57028	542.88	+83.21	-46.18	2.540	0.979	9.305	0.583	1146.6	1.269	4.300
58000	58031	544.54	+84.87	-45.76	2.440	0.976	8.992	0.576	1148.5	1.273	4.313
59000	59034	546.19	+86.52	-45.34	2.344	0.973	8.690	0.569	1150.4	1.276	4.326
60000	60038	547.85	+88.18	-44.92	2.252	1.000	8.398 − 5	0.562	1152.3	1.280 − 5	4.339 − 6
61000	61041	549.50	+89.83	-44.50	2.164	0.997	8.116	0.555	1154.2	1.283	4.352
62000	62045	551.16	+91.49	-44.08	2.079	0.994	7.844	0.548	1156.1	1.287	4.365
63000	63049	552.81	+93.14	-43.66	1.998	0.991	7.581	0.541	1158.0	1.290	4.378
64000	64053	554.47	+94.80	-43.24	1.921	0.988	7.327	0.534	1159.9	1.294	4.391
65000	65057	556.12	+96.45	-42.82	1.846	0.985	7.082	0.527	1161.8	1.297	4.404
66000	66061	557.78	+98.11	-42.40	1.775	0.982	6.845	0.520	1163.7	1.301	4.417
67000	67065	559.43	+99.76	-41.98	1.707	0.979	6.616	0.513	1165.6	1.304	4.430
68000	68069	561.09	+101.42	-41.56	1.642	0.976	6.395	0.506	1167.5	1.308	4.443
69000	69073	562.74	+103.07	-41.14	1.579	0.973	6.181	0.499	1169.4	1.311	4.456
70000	70078	564.40	+104.73	-40.72	1.519	1.000	5.974 − 5	0.492	1171.3	1.315 − 5	4.469 − 6
71000	71082	566.05	+106.38	-40.30	1.461	0.997	5.774	0.485	1173.2	1.318	4.482
72000	72087	567.71	+108.04	-39.88	1.406	0.994	5.581	0.478	1175.1	1.322	4.495
73000	73092	569.36	+109.69	-39.46	1.353	0.991	5.394	0.471	1177.0	1.325	4.508
74000	74096	571.02	+111.35	-39.04	1.302	0.988	5.214	0.464	1178.9	1.329	4.521
75000	75101	572.67	+113.00	-38.62	1.253	0.985	5.040	0.457	1180.8	1.332	4.534
76000	76106	574.33	+114.66	-38.20	1.206	0.982	4.872	0.450	1182.7	1.336	4.547
77000	77111	575.98	+116.31	-37.78	1.161	0.979	4.710	0.443	1184.6	1.339	4.560
78000	78116	577.64	+117.97	-37.36	1.117	0.976	4.554	0.436	1186.5	1.343	4.573
79000	79122	579.29	+119.62	-36.94	1.075	0.973	4.403	0.429	1188.4	1.346	4.586

TABLE 5.2.—*Continued*
75° N, January (Warm)
GEOMETRIC ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, ft	H, ft	T, °R	t, °F	$T - T_{std}$	P, in. Hg	$\frac{P}{P_{std}}$	ρ, lb ft^{-3}	$\frac{\rho}{\rho_{std}}$	C, ft sec^{-1}	μ, lb ft^{-1} sec^{-1}	λ, BTU ft^{-1} sec^{-1} (°R)$^{-1}$
0	0	448.59	-11.08	-70.08	29.93 + 1	1.000	8.894 - 2	1.157	1038.3	1.072 - 5	3.566 - 6
1000	1002	450.45	-9.42	-69.86	28.870	0.995	8.851	1.138	1040.2	1.075	3.578
2000	2004	451.90	-7.77	-69.63	27.793	0.990	8.077	1.120	1042.1	1.078	3.590
3000	3006	453.36	-6.11	-69.41	26.741	0.985	7.320	1.103	1044.0	1.081	3.603
4000	4008	454.22	-4.45	-69.19	25.534	0.981	7.581	1.087	1045.9	1.085	3.615
5000	5010	456.08	-3.21	-68.38	24.932	0.977	7.066	1.072	1047.8	1.087	3.624
6000	6012	456.63	-0.24	-68.85	23.834	0.973	6.823	1.067	1048.9	1.081	3.602
7000	7013	458.39	+1.28	-68.33	22.239	0.970	6.590	1.063	1050.4	1.075	3.579
8000	8015	447.95	-12.32	-62.80	21.147	0.966	6.363	1.058	1036.9	1.069	3.557
9000	9016	444.31	-15.36	-62.28	20.059	0.962	6.142	1.054	1033.3	1.064	3.535
10000	10018	441.28	-18.39	-61.75	18.973 + 1	0.959	5.928 - 2	1.050	1029.8	1.058 - 5	3.513 - 6
11000	11019	438.24	-21.43	-61.22	17.891	0.955	5.720	1.045	1026.2	1.052	3.491
12000	12020	435.21	-24.46	-60.69	16.811	0.952	5.517	1.041	1022.7	1.046	3.469
13000	13021	432.18	-27.49	-60.16	15.735	0.948	5.321	1.036	1019.1	1.040	3.446
14000	14022	429.16	-30.51	-59.62	14.661	0.945	5.130	1.032	1015.6	1.034	3.424
15000	15023	426.13	-33.54	-59.08	13.589	0.941	4.944	1.027	1012.0	1.028	3.402
16000	16024	423.11	-36.56	-58.55	12.521	0.938	4.765	1.023	1008.4	1.022	3.379
17000	17024	420.08	-39.59	-58.01	11.455	0.934	4.590	1.018	1004.8	1.016	3.357
18000	18025	417.06	-42.61	-57.48	10.391	0.930	4.421	1.014	1001.1	1.010	3.335
19000	19025	414.03	-45.64	-56.94	9.329	0.926	4.257	1.009	997.5	1.004	3.312
20000	20026	411.01	-48.66	-56.40	8.270 + 1	0.923	4.097 - 2	1.005	993.8	9.979 - 6	3.290 - 6
21000	21026	407.99	-51.68	-55.87	8.214	0.919	3.943	1.000	990.2	9.919	3.267
22000	22026	404.97	-54.70	-55.33	8.159	0.916	3.793	0.996	986.5	9.858	3.245
23000	23026	401.95	-57.72	-54.79	8.106	0.913	3.648	0.992	982.8	9.797	3.222
24000	24026	398.93	-60.74	-54.25	8.056	0.909	3.508	0.987	979.1	9.736	3.200
25000	25026	395.91	-63.76	-53.71	8.007	0.906	3.372	0.983	975.4	9.674	3.177
26000	26026	392.89	-66.78	-53.18	9.603 + 0	0.903	3.240	0.979	971.7	9.612	3.154
27000	27026	389.87	-69.80	-52.64	9.154	0.899	3.112	0.974	968.0	9.551	3.132
28000	28025	387.48	-72.19	-51.47	8.723	0.895	2.984	0.968	965.0	9.502	3.114
29000	29025	389.02	-70.65	-48.38	8.312	0.892	2.852	0.953	966.9	9.533	3.125
30000	30024	390.55	-69.12	-45.28	7.922 + 0	0.890	2.689 - 2	0.938	968.8	9.565 - 6	3.137 - 6
31000	31023	392.09	-67.58	-46.19	7.552	0.888	2.553	0.924	970.7	9.596	3.148
32000	32023	393.62	-66.05	-41.10	7.200	0.886	2.425	0.911	972.6	9.627	3.160
33000	33022	395.16	-64.51	-40.01	6.866	0.885	2.303	0.899	974.5	9.659	3.171
34000	34021	396.69	-62.98	-0.92	6.549	0.885	2.188	0.887	976.4	9.690	3.183
35000	35020	398.23	-61.44	-4.16	6.248	0.885	2.080	0.876	978.3	9.721	3.194
36000	36019	399.76	-59.91	9.25	5.961	0.886	1.977	0.865	980.2	9.752	3.206
37000	37017	399.87	-59.80	9.90	5.689	0.886	1.880	0.865	980.3	9.755	3.207
38000	38016	399.87	-59.80	9.90	5.428	0.887	1.800	0.866	980.3	9.755	3.207
39000	39015	399.87	-59.80	9.90	5.180	0.888	1.717	0.866	980.3	9.755	3.207
40000	40013	399.87	-59.80	9.90	4.943 + 0	0.889	1.639 - 2	0.867	980.3	9.755 - 6	3.207 - 6
41000	41011	399.87	-59.80	9.90	4.717	0.890	1.564	0.868	980.3	9.755	3.207
42000	42010	399.87	-59.80	9.90	4.502	0.891	1.492	0.869	980.3	9.755	3.207
43000	43008	399.87	-59.80	9.90	4.296	0.892	1.424	0.870	980.3	9.755	3.207
44000	44006	399.87	-59.80	9.90	4.100	0.893	1.359	0.871	980.3	9.755	3.207
45000	45004	399.87	-59.80	9.90	3.912	0.894	1.297	0.872	980.3	9.755	3.207
46000	46002	399.87	-59.80	9.90	3.733	0.895	1.238	0.873	980.3	9.755	3.207
47000	47000	399.87	-59.80	9.90	3.563	0.896	1.181	0.874	980.3	9.755	3.207
48000	47997	399.87	-59.80	9.90	3.400	0.897	1.127	0.875	980.3	9.755	3.207
49000	48995	399.87	-59.80	9.90	3.245	0.898	1.076	0.876	980.3	9.755	3.207
50000	49992	399.87	-59.80	9.90	3.097 + 0	0.899	1.027 - 2	0.877	980.3	9.755 - 6	3.207 - 6
51000	50990	399.87	-59.80	9.90	2.955	0.900	9.797 - 3	0.878	980.3	9.755	3.207
52000	51987	399.87	-59.80	9.90	2.820	0.901	9.349	0.879	980.3	9.755	3.207
53000	52984	399.87	-59.80	9.90	2.691	0.902	8.922	0.880	980.3	9.755	3.207
54000	53981	399.87	-59.80	9.90	2.568	0.903	8.515	0.881	980.3	9.755	3.207
55000	54979	399.87	-59.80	9.90	2.451	0.904	8.126	0.881	980.3	9.755	3.207
56000	55975	399.93	-59.74	9.96	2.339	0.905	7.754	0.882	980.4	9.756	3.207
57000	56972	400.20	-59.47	10.23	2.233	0.906	7.395	0.883	980.7	9.761	3.209
58000	57969	400.47	-59.20	10.50	2.131	0.907	7.053	0.883	981.0	9.767	3.211
59000	58966	400.75	-58.92	10.78	2.034	0.908	6.727	0.884	981.4	9.772	3.213
60000	59962	401.02	-58.65	11.05	1.941 + 0	0.909	6.417 - 3	0.884	981.7	9.778 - 6	3.215 - 6
61000	60959	401.29	-58.38	11.32	1.853	0.910	6.120	0.884	982.0	9.784	3.217
62000	61955	401.57	-58.10	11.60	1.769	0.911	5.838	0.885	982.4	9.789	3.219
63000	62951	401.84	-57.83	11.87	1.688	0.913	5.569	0.885	982.7	9.795	3.221
64000	63948	402.11	-57.56	12.14	1.612	0.914	5.313	0.886	983.0	9.800	3.223
65000	64944	402.39	-57.28	12.42	1.539	0.915	5.069	0.887	983.4	9.806	3.226
66000	65940	402.66	-57.01	12.59	1.469	0.916	4.836	0.888	983.7	9.811	3.228
67000	66936	402.93	-56.74	12.32	1.402	0.918	4.613	0.889	984.0	9.817	3.230
68000	67931	403.21	-56.46	12.05	1.339	0.919	4.402	0.891	984.4	9.822	3.232
69000	68927	403.48	-56.19	11.78	1.278	0.920	4.200	0.893	984.7	9.828	3.234
70000	69923	403.75	-55.92	11.51	1.221 + 0	0.921	4.007 - 3	0.895	985.0	9.833 - 6	3.236 - 6
71000	70918	404.03	-55.64	11.23	1.165	0.922	3.824	0.897	985.4	9.839	3.238
72000	71914	404.30	-55.37	10.96	1.113	0.924	3.649	0.898	985.7	9.844	3.240
73000	72909	404.57	-55.10	10.69	1.063	0.924	3.482	0.900	986.0	9.850	3.242
74000	73904	404.85	-54.82	10.42	1.015	0.925	3.323	0.901	986.4	9.855	3.244
75000	74899	405.12	-54.55	10.15	9.691 - 1	0.927	3.171	0.903	986.7	9.861	3.246
76000	75894	405.39	-54.28	9.88	9.255	0.927	3.027	0.905	987.0	9.866	3.248
77000	76889	405.66	-54.01	9.60	8.839	0.928	2.889	0.906	987.4	9.872	3.250
78000	77884	405.94	-53.73	9.33	8.442	0.929	2.757	0.908	987.7	9.877	3.252
79000	78879	406.21	-53.46	9.06	8.064	0.930	2.632	0.909	988.0	9.883	3.254

TABLE 5.2.—*Continued*
75° N. January (Warm)
GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, ft	Z, ft	T, °R	t, °F	$T-T_{std}$	P, in. Hg	$\frac{P}{P_{std}}$	ρ, lb ft^{-3}	$\frac{\rho}{\rho_{std}}$	C_s, ft sec^{-1}	μ, lb ft^{-1} sec^{-1}	λ, BTU ft^{-1} sec^{-1} (°R)$^{-1}$
80000	80127	406.52	−53.15	8.66	7.657 − 1	0.939	2.497 − 3	0.919	988.4	9.889 − 6	3.256 − 6
81000	81133	406.79	−52.88	8.38	7.312	0.940	2.383	0.921	988.7	9.895	3.258
82000	82138	407.07	−52.60	8.11	6.983	0.941	2.274	0.922	989.1	9.900	3.260
83000	83144	407.88	−51.79	8.37	6.669	0.942	2.168	0.922	990.1	9.916	3.265
84000	84150	408.70	−50.97	8.64	6.370	0.943	2.066	0.923	991.1	9.933	3.273
85000	85155	409.52	−50.15	8.92	6.085	0.944	1.970	0.923	992.0	9.950	3.279
86000	86161	410.35	−49.32	9.19	5.813	0.945	1.878	0.923	993.0	9.966	3.285
87000	87167	411.17	−48.50	9.47	5.553	0.946	1.790	0.924	994.0	9.983	3.291
88000	88174	411.99	−47.68	9.74	5.306	0.947	1.707	0.924	995.0	9.999	3.297
89000	89180	412.82	−46.85	10.02	5.070	0.948	1.628	0.925	996.0	1.002 − 5	3.303
90000	90186	413.64	−46.03	10.29	4.846 − 1	0.949	1.553 − 3	0.925	997.0	1.003 − 5	3.309 − 6
91000	91193	414.46	−45.21	10.57	4.631	0.950	1.481	0.926	998.0	1.005	3.315
92000	92199	415.28	−44.39	10.86	4.427	0.951	1.413	0.926	999.0	1.006	3.322
93000	93206	416.11	−43.56	11.11	4.231	0.952	1.348	0.926	1000.0	1.008	3.328
94000	94213	416.93	−42.74	11.39	4.045	0.953	1.286	0.927	1001.0	1.010	3.334
95000	95219	417.75	−41.92	11.66	3.868	0.954	1.227	0.928	1002.0	1.011	3.340
96000	96226	418.58	−41.09	11.94	3.698	0.956	1.171	0.929	1003.0	1.013	3.346
97000	97233	419.40	−40.27	12.21	3.536	0.957	1.118	0.929	1003.9	1.015	3.352
98000	98240	420.22	−39.45	12.48	3.382	0.958	1.067	0.930	1004.9	1.016	3.358

TABLE 5.2.—*Continued*
75° N, January (Warm)
GEOMETRIC ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, ft	H, ft	T, °R	t, °F	$T-T_{std}$	P, in. Hg	$\frac{P}{P_{std}}$	ρ, lb ft^{-3}	$\frac{\rho}{\rho_{std}}$	C_s ft sec^{-1}	μ lb ft^{-1} sec^{-1}	k BTU ft^{-1} sec^{-1}(°R)$^{-1}$
80000	79874	406.48	−53.19	8.79	7.702 − 1	0.931	2.512 − 3	0.911	988.4	9.888 − 6	3.256 − 6
81000	80868	406.76	−52.91	8.52	7.357	0.932	2.398	0.912	988.7	9.894	3.258
82000	81863	407.03	−52.64	8.25	7.027	0.933	2.289	0.914	989.0	9.899	3.260
83000	82857	407.76	−51.91	8.43	6.713	0.933	2.182	0.914	989.9	9.914	3.266
84000	83851	408.58	−51.09	8.71	6.414	0.934	2.081	0.914	990.9	9.931	3.272
85000	84845	409.40	−50.27	8.98	6.128	0.935	1.984	0.914	991.9	9.947	3.278
86000	85840	410.21	−49.46	9.26	5.855	0.936	1.892	0.915	992.9	9.963	3.284
87000	86834	411.03	−48.64	9.53	5.596	0.937	1.805	0.915	993.9	9.980	3.290
88000	87827	411.85	−47.82	9.80	5.348	0.938	1.721	0.916	994.9	9.996	3.296
89000	88821	412.67	−47.00	10.08	5.112	0.939	1.642	0.916	995.9	1.001 − 5	3.302
90000	89815	413.49	−46.18	10.35	4.886 − 1	0.940	1.567 − 3	0.916	996.8	1.003 − 5	3.308 − 6
91000	90809	414.30	−45.37	10.62	4.671	0.941	1.495	0.916	997.8	1.005	3.314
92000	91802	415.12	−44.55	10.90	4.466	0.942	1.426	0.917	998.8	1.006	3.320
93000	92796	415.94	−43.73	11.17	4.271	0.943	1.361	0.917	999.8	1.008	3.326
94000	93789	416.76	−42.91	11.45	4.084	0.944	1.299	0.918	1000.8	1.009	3.332
95000	94782	417.57	−42.10	11.72	3.906	0.945	1.240	0.918	1001.8	1.011	3.338
96000	95775	418.39	−41.28	11.99	3.735	0.946	1.184	0.919	1002.7	1.013	3.345
97000	96768	419.21	−40.46	12.27	3.573	0.947	1.130	0.919	1003.7	1.014	3.351
98000	97761	420.03	−39.64	12.54	3.418	0.948	1.079	0.920	1004.7	1.016	3.357

TABLE 5.2.—*Continued*
75° N. July
GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, ft	Z, ft	T, °R	t, °F	$T - T_{std}$	P, in. Hg	$\frac{P}{P_{std}}$	ρ, lb ft^{-3}	$\frac{\rho}{\rho_{std}}$	C_s ft sec^{-1}	μ lb ft^{-1} sec^{-1}	k BTU ft^{-1} sec^{-1}(°R)$^{-1}$
0	0	502.06	42.39	-16.61	2.990	+ 1	0.999	7.895 - 2	1.032	1098.4	1.172 - 5	3.950 - 6
1000	998	500.56	40.89	-14.54	2.880		0.998	7.628	1.027	1096.8	1.169	3.940
2000	1998	499.06	39.39	-12.48	2.774		0.997	7.369	1.022	1095.1	1.167	3.929
3000	2994	497.56	37.89	-10.41	2.672		0.996	7.118	1.017	1093.5	1.164	3.918
4000	3992	496.06	36.39	-8.34	2.573		0.996	6.876	1.012	1091.8	1.161	3.908
5000	4990	494.57	34.90	-6.27	2.477		0.995	6.640	1.008	1090.2	1.158	3.897
6000	5988	493.07	33.40	-4.20	2.385		0.995	6.412	1.003	1088.6	1.156	3.887
7000	6987	491.60	31.93	-2.11	2.296		0.994	6.191	0.999	1086.9	1.153	3.876
8000	7985	490.15	30.48	0.01	2.210		0.995	5.977	0.994	1085.3	1.150	3.866
9000	8984	488.97	27.27	0.36	2.127		0.994	5.790	0.994	1081.8	1.144	3.843
10000	9982	483.27	23.60	0.27	2.046	+ 1	0.994	5.613 - 2	0.994	1077.7	1.138 - 5	3.817 - 6
11000	10981	479.61	19.94	0.17	1.968		0.994	5.440	0.994	1073.6	1.131	3.791
12000	11980	475.95	16.28	0.07	1.892		0.994	5.271	0.994	1069.5	1.124	3.764
13000	12979	472.29	12.62	-0.02	1.819		0.995	5.106	0.994	1065.4	1.117	3.738
14000	13978	468.67	9.00	-0.07	1.748		0.994	4.944	0.995	1061.3	1.110	3.712
15000	14977	465.06	5.39	-0.11	1.679		0.995	4.786	0.995	1057.2	1.103	3.686
16000	15976	461.46	1.79	-0.15	1.613		0.994	4.633	0.995	1053.1	1.096	3.660
17000	16976	457.85	-1.82	-0.20	1.548		0.994	4.482	0.995	1048.9	1.090	3.634
18000	17975	454.24	-5.43	-0.24	1.486		0.995	4.336	0.995	1044.8	1.083	3.607
19000	18975	450.63	-9.04	-0.28	1.426		0.994	4.193	0.995	1040.7	1.076	3.581
20000	19974	447.03	-12.64	-0.31	1.367	+ 1	0.994	4.054 - 2	0.995	1036.5	1.069 - 5	3.555 - 6
21000	20974	443.45	-16.22	-0.33	1.311		0.995	3.919	0.995	1032.3	1.062	3.529
22000	21974	439.87	-19.80	-0.34	1.256		0.994	3.788	0.995	1028.1	1.055	3.503
23000	22974	436.29	-23.38	-0.36	1.204		0.994	3.658	0.995	1024.0	1.048	3.476
24000	23974	432.71	-26.96	-0.38	1.153		0.994	3.532	0.995	1019.7	1.041	3.450
25000	24974	429.12	-30.55	-0.39	1.104		0.994	3.410	0.995	1015.5	1.034	3.424
26000	25974	425.54	-34.13	-0.41	1.056		0.994	3.291	0.995	1011.3	1.027	3.397
27000	26974	421.97	-37.70	-0.41	1.011		0.994	3.175	0.995	1007.0	1.020	3.371
28000	27975	418.40	-41.27	-0.42	9.667	+ 0	0.994	3.063	0.995	1002.7	1.013	3.345
29000	28975	414.83	-44.84	-0.42	9.242		0.994	2.953	0.995	998.5	1.006	3.318
30000	29976	411.26	-48.41	-0.43	8.832	+ 0	0.994	2.847 - 2	0.995	994.1	9.984 - 6	3.292 - 6
31000	30977	407.68	-51.99	-0.43	8.436		0.994	2.743	0.995	989.8	9.913	3.265
32000	31977	404.54	-55.13	2.99	8.057		0.994	2.621	0.987	989.6	9.910	3.264
33000	32978	408.09	-51.58	7.10	7.695		0.995	2.500	0.977	990.3	9.921	3.268
34000	33979	408.63	-51.04	11.21	7.350		0.996	2.384	0.968	991.0	9.932	3.272
35000	34980	409.18	-50.49	15.32	7.021		0.997	2.275	0.960	991.6	9.943	3.276
36000	35981	409.72	-49.95	19.43	6.706		0.999	2.170	0.952	992.3	9.954	3.280
37000	36983	410.27	-49.40	20.30	6.407		1.002	2.070	0.952	993.0	9.965	3.284
38000	37984	410.82	-48.85	20.85	6.121		1.004	1.975	0.953	993.6	9.976	3.288
39000	38985	411.37	-48.30	21.40	5.848		1.006	1.885	0.954	994.3	9.987	3.292
40000	39987	411.92	-47.75	21.95	5.588	+ 0	1.009	1.798 - 2	0.955	994.9	9.998 - 6	3.297 - 6
41000	40989	412.46	-47.21	22.49	5.339		1.012	1.716	0.957	995.6	1.001 - 5	3.301
42000	41990	413.01	-46.66	23.04	5.102		1.014	1.638	0.958	996.3	1.002	3.305
43000	42992	413.56	-46.11	23.59	4.876		1.017	1.563	0.959	996.9	1.003	3.309
44000	43994	414.11	-45.56	24.14	4.660		1.020	1.492	0.961	997.6	1.004	3.313
45000	44996	414.27	-45.40	24.30	4.454		1.023	1.425	0.963	997.8	1.004	3.314
46000	45998	414.27	-45.40	24.30	4.257		1.026	1.362	0.965	997.8	1.004	3.314
47000	47000	414.27	-45.40	24.30	4.069		1.028	1.302	0.968	997.8	1.004	3.314
48000	48003	414.27	-45.40	24.30	3.889		1.031	1.244	0.971	997.8	1.004	3.314
49000	49005	414.27	-45.40	24.30	3.717		1.034	1.189	0.973	997.8	1.004	3.314
50000	50008	414.27	-45.40	24.30	3.552	+ 0	1.037	1.137 - 2	0.977	997.8	1.004 - 5	3.314 - 6
51000	51010	414.27	-45.40	24.30	3.395		1.040	1.086	0.979	997.8	1.004	3.314
52000	52013	414.27	-45.40	24.30	3.245		1.043	1.038	0.982	997.8	1.004	3.314
53000	53016	414.27	-45.40	24.30	3.101		1.046	9.924 - 3	0.985	997.8	1.004	3.314
54000	54019	414.27	-45.40	24.30	2.964		1.049	9.485	0.987	997.8	1.004	3.314
55000	55022	414.27	-45.40	24.30	2.833		1.052	9.066	0.990	997.8	1.004	3.314
56000	56025	414.27	-45.40	24.30	2.708		1.055	8.665	0.993	997.8	1.004	3.314
57000	57028	414.27	-45.40	24.30	2.588		1.058	8.281	0.996	997.8	1.004	3.314
58000	58031	414.27	-45.40	24.30	2.473		1.061	7.915	0.999	997.8	1.004	3.314
59000	59034	414.27	-45.40	24.30	2.364		1.064	7.565	1.001	997.8	1.004	3.314
60000	60038	414.27	-45.40	24.30	2.259	+ 0	1.067	7.230 - 3	1.004	997.8	1.004 - 5	3.314 - 6
61000	61041	414.27	-45.40	24.30	2.160		1.070	6.910	1.007	997.8	1.004	3.314
62000	62045	414.27	-45.40	24.30	2.064		1.073	6.605	1.010	997.8	1.004	3.314
63000	63049	414.27	-45.40	24.30	1.973		1.076	6.312	1.013	997.8	1.004	3.314
64000	64053	414.27	-45.40	24.30	1.885		1.079	6.033	1.016	997.8	1.004	3.314
65000	65057	414.27	-45.40	24.30	1.802		1.082	5.766	1.019	997.8	1.004	3.314
66000	66061	414.27	-45.40	24.09	1.722		1.085	5.511	1.022	997.8	1.004	3.314
67000	67065	414.27	-45.40	23.54	1.646		1.088	5.267	1.026	997.8	1.004	3.314
68000	68069	414.27	-45.40	22.99	1.573		1.091	5.034	1.030	997.8	1.004	3.314
69000	69073	414.27	-45.40	22.44	1.504		1.094	4.812	1.035	997.8	1.004	3.314
70000	70078	414.27	-45.40	21.90	1.437	+ 0	1.097	4.599 - 3	1.039	997.8	1.004 - 5	3.314 - 6
71000	71082	414.27	-45.40	21.35	1.374		1.100	4.395	1.043	997.8	1.004	3.314
72000	72087	414.27	-45.40	20.80	1.313		1.102	4.201	1.047	997.8	1.004	3.314
73000	73092	414.27	-45.40	20.25	1.255		1.105	4.015	1.051	997.8	1.004	3.314
74000	74096	414.27	-45.40	19.70	1.199		1.107	3.838	1.055	997.8	1.004	3.314
75000	75101	414.27	-45.40	19.15	1.146		1.110	3.668	1.059	997.8	1.004	3.314
76000	76106	414.27	-45.40	18.60	1.096		1.112	3.506	1.062	997.8	1.004	3.314
77000	77111	414.27	-45.40	18.06	1.047		1.114	3.351	1.066	997.8	1.004	3.314
78000	78116	414.86	-44.81	18.10	1.001		1.117	3.198	1.068	998.5	1.006	3.318
79000	79122	415.52	-44.15	18.21	9.566	- 1	1.119	3.052	1.070	999.3	1.007	3.323

TABLE 5.2.—*Continued*
75° N, July
GEOMETRIC ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, ft	H, ft	T, °R	t, °F	$T-T_{std}$	P, in. Hg	$\frac{P}{P_{std}}$	ρ, lb ft^{-3}	$\frac{\rho}{\rho_{std}}$	C, ft sec^{-1}	μ, lb ft^{-1} sec^{-1}	k, BTU ft^{-1} sec^{-1} (°R)$^{-1}$
0	0	502.06	42.39	-16.61	2.990	+ 1	0.999	7.895 - 2	1.032	1098.9	1.172 - 5	3.950 - 6
1000	1002	500.56	40.89	-14.55	2.880		0.998	7.627	1.027	1096.8	1.169	3.940
2000	2004	499.05	39.38	-12.48	2.774		0.997	7.364	1.022	1095.1	1.167	3.929
3000	3006	497.55	37.88	-10.42	2.671		0.996	7.117	1.017	1093.5	1.164	3.918
4000	4008	496.05	36.38	-8.36	2.572		0.995	6.874	1.012	1091.8	1.161	3.908
5000	5010	494.55	34.88	-6.29	2.476		0.995	6.638	1.007	1090.2	1.158	3.897
6000	6012	493.06	33.39	-4.22	2.384		0.994	6.410	1.003	1088.5	1.156	3.886
7000	7013	491.56	31.91	-2.14	2.295		0.994	6.188	0.998	1086.9	1.153	3.876
8000	8015	490.13	30.46	-0.02	2.209		0.994	5.974	0.993	1085.3	1.150	3.866
9000	9016	488.88	27.21	0.29	2.125		0.994	5.767	0.993	1081.7	1.144	3.842
10000	10018	483.21	23.54	0.29	2.045	+ 1	0.994	5.610 - 2	0.993	1077.6	1.137 - 5	3.816 - 6
11000	11019	479.54	19.87	0.08	1.967		0.993	5.458	0.993	1073.5	1.131	3.790
12000	12020	475.88	16.21	-0.02	1.891		0.994	5.267	0.993	1069.4	1.124	3.764
13000	13021	472.21	12.54	-0.13	1.817		0.994	5.102	0.994	1065.3	1.117	3.737
14000	14022	468.59	8.92	-0.18	1.746		0.993	4.941	0.994	1061.2	1.110	3.711
15000	15023	464.98	5.31	-0.23	1.678		0.993	4.783	0.994	1057.1	1.103	3.685
16000	16024	461.37	1.70	-0.28	1.611		0.993	4.629	0.994	1053.0	1.096	3.659
17000	17024	457.76	-1.91	-0.33	1.547		0.993	4.479	0.994	1048.8	1.089	3.633
18000	18025	454.15	-5.52	-0.38	1.484		0.993	4.333	0.993	1044.7	1.083	3.607
19000	19025	450.54	-9.13	-0.43	1.424		0.992	4.190	0.994	1040.5	1.076	3.581
20000	20026	446.94	-12.73	-0.47	1.366	+ 1	0.993	4.051 - 2	0.994	1036.4	1.069 - 5	3.554 - 6
21000	21026	443.36	-16.31	-0.50	1.309		0.992	3.915	0.993	1032.2	1.062	3.528
22000	22026	439.78	-19.89	-0.52	1.255		0.992	3.783	0.993	1028.0	1.055	3.502
23000	23026	436.19	-23.48	-0.54	1.202		0.992	3.654	0.993	1023.8	1.048	3.476
24000	24026	432.61	-27.06	-0.57	1.152		0.992	3.529	0.993	1019.6	1.041	3.449
25000	25026	429.03	-30.64	-0.59	1.103		0.992	3.407	0.993	1015.4	1.034	3.423
26000	26026	425.45	-34.22	-0.61	1.055		0.992	3.288	0.993	1011.2	1.027	3.397
27000	27026	421.88	-37.79	-0.63	1.010		0.992	3.173	0.993	1006.9	1.020	3.370
28000	28025	418.31	-41.36	-0.64	9.656	+ 0	0.991	3.060	0.993	1002.6	1.013	3.344
29000	29025	414.74	-44.93	-0.66	9.231		0.991	2.951	0.993	998.3	1.005	3.317
30000	30024	411.17	-48.50	-0.67	8.822	+ 0	0.991	2.844 - 2	0.992	994.0	9.983 - 6	3.291 - 6
31000	31023	407.60	-52.07	-0.68	8.427		0.991	2.741	0.992	989.7	9.911	3.264
32000	32023	407.55	-52.12	2.82	8.049		0.991	2.618	0.984	989.7	9.910	3.264
33000	33022	408.10	-51.57	6.92	7.687		0.991	2.497	0.974	990.3	9.921	3.268
34000	34021	408.64	-51.03	11.02	7.343		0.992	2.382	0.965	991.0	9.932	3.272
35000	35020	409.19	-50.48	15.12	7.014		0.994	2.272	0.957	991.6	9.943	3.276
36000	36019	409.73	-49.94	19.22	6.701		0.995	2.168	0.949	992.3	9.954	3.280
37000	37017	410.28	-49.39	20.31	6.402		0.998	2.068	0.948	993.0	9.965	3.284
38000	38016	410.83	-48.84	20.86	6.116		1.000	1.974	0.949	993.6	9.976	3.288
39000	39015	411.38	-48.29	21.41	5.844		1.002	1.883	0.950	994.3	9.987	3.292
40000	40013	411.92	-47.75	21.95	5.584	+ 0	1.005	1.797 - 2	0.951	995.0	9.998 - 6	3.297 - 6
41000	41011	412.47	-47.20	22.50	5.337		1.007	1.715	0.952	995.6	1.001 - 5	3.301
42000	42010	413.02	-46.65	23.05	5.100		1.010	1.637	0.953	996.3	1.002	3.305
43000	43008	413.57	-46.10	23.60	4.874		1.012	1.562	0.954	996.9	1.003	3.309
44000	44006	414.11	-45.56	24.14	4.659		1.015	1.491	0.956	997.6	1.004	3.313
45000	45004	414.27	-45.40	24.30	4.453		1.018	1.425	0.959	997.8	1.004	3.314
46000	46002	414.27	-45.40	24.30	4.257		1.021	1.362	0.961	997.8	1.004	3.314
47000	47000	414.27	-45.40	24.30	4.069		1.023	1.302	0.963	997.8	1.004	3.314
48000	47997	414.27	-45.40	24.30	3.889		1.026	1.244	0.966	997.8	1.004	3.314
49000	48995	414.27	-45.40	24.30	3.717		1.029	1.190	0.969	997.8	1.004	3.314
50000	49992	414.27	-45.40	24.30	3.553	+ 0	1.032	1.137 - 2	0.971	997.8	1.004 - 5	3.314 - 6
51000	50990	414.27	-45.40	24.30	3.397		1.034	1.087	0.974	997.8	1.004	3.314
52000	51987	414.27	-45.40	24.30	3.247		1.037	1.039	0.976	997.8	1.004	3.314
53000	52984	414.27	-45.40	24.30	3.104		1.040	9.931 - 3	0.979	997.8	1.004	3.314
54000	53981	414.27	-45.40	24.30	2.967		1.043	9.493	0.982	997.8	1.004	3.314
55000	54979	414.27	-45.40	24.30	2.836		1.046	9.074	0.984	997.8	1.004	3.314
56000	55975	414.27	-45.40	24.30	2.711		1.049	8.674	0.987	997.8	1.004	3.314
57000	56972	414.27	-45.40	24.30	2.591		1.052	8.292	0.990	997.8	1.004	3.314
58000	57969	414.27	-45.40	24.30	2.477		1.054	7.926	0.992	997.8	1.004	3.314
59000	58966	414.27	-45.40	24.30	2.368		1.057	7.577	0.995	997.8	1.004	3.314
60000	59962	414.27	-45.40	24.30	2.263	+ 0	1.060	7.243 - 3	0.998	997.8	1.004 - 5	3.314 - 6
61000	60959	414.27	-45.40	24.30	2.164		1.063	6.923	1.000	997.8	1.004	3.314
62000	61955	414.27	-45.40	24.30	2.068		1.066	6.618	1.003	997.8	1.004	3.314
63000	62951	414.27	-45.40	24.30	1.977		1.069	6.326	1.006	997.8	1.004	3.314
64000	63948	414.27	-45.40	24.30	1.890		1.071	6.048	1.009	997.8	1.004	3.314
65000	64944	414.27	-45.40	24.30	1.807		1.074	5.781	1.011	997.8	1.004	3.314
66000	65940	414.27	-45.40	24.20	1.727		1.077	5.526	1.014	997.8	1.004	3.314
67000	66936	414.27	-45.40	23.66	1.651		1.080	5.283	1.018	997.8	1.004	3.314
68000	67931	414.27	-45.40	23.11	1.578		1.083	5.050	1.022	997.8	1.004	3.314
69000	68927	414.27	-45.40	22.57	1.509		1.085	4.828	1.027	997.8	1.004	3.314
70000	69923	414.27	-45.40	22.02	1.442	+ 0	1.088	4.615 - 3	1.030	997.8	1.004 - 5	3.314 - 6
71000	70918	414.27	-45.40	21.48	1.379		1.091	4.412	1.034	997.8	1.004	3.314
72000	71914	414.27	-45.40	20.93	1.318		1.094	4.217	1.038	997.8	1.004	3.314
73000	72909	414.27	-45.40	20.39	1.260		1.096	4.032	1.042	997.8	1.004	3.314
74000	73904	414.27	-45.40	19.84	1.204		1.098	3.854	1.046	997.8	1.004	3.314
75000	74899	414.27	-45.40	19.30	1.151		1.101	3.685	1.049	997.8	1.004	3.314
76000	75894	414.27	-45.40	18.76	1.101		1.103	3.522	1.053	997.8	1.004	3.314
77000	76889	414.27	-45.40	18.21	1.052		1.105	3.367	1.057	997.8	1.004	3.314
78000	77884	414.79	-44.88	18.18	1.006		1.107	3.215	1.059	998.4	1.005	3.318
79000	78879	415.44	-44.23	18.29	9.618	- 1	1.110	3.069	1.061	999.2	1.007	3.323

TABLE 5.2 – *Continued*
75° N. July
GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
H, ft	Z, ft	T, °R	t, °F	$T-T_{std}$	P, in. Hg	$\frac{P}{P_{std}}$	ρ, lb ft^{-3}	$\frac{\rho}{\rho_{std}}$	C_s, ft sec^{-1}	μ, lb ft^{-1} sec^{-1}	k, BTU ft^{-1} sec^{-1}(°R)$^{-1}$
80000	80127	416.16	−43.49	18.32	9.144 − 1	1.121	2.913 − 3	1.072	1000.1	1.008 − 5	3.328 − 6
81000	81133	416.64	−42.83	18.43	8.742	1.124	2.780	1.074	1000.9	1.010	3.333
82000	82138	417.30	−42.17	18.54	8.358	1.126	2.654	1.076	1001.7	1.011	3.338
83000	83144	418.15	−41.52	18.65	7.991	1.128	2.533	1.078	1002.4	1.012	3.343
84000	84150	418.81	−40.86	18.76	7.641	1.131	2.419	1.080	1003.2	1.014	3.348
85000	85155	419.47	−40.20	18.87	7.307	1.133	2.309	1.082	1004.0	1.015	3.353
86000	86161	420.13	−39.54	18.98	6.988	1.136	2.205	1.084	1004.8	1.016	3.357
87000	87167	420.79	−38.88	19.09	6.683	1.138	2.105	1.086	1005.6	1.017	3.362
88000	88174	421.45	−38.22	19.20	6.392	1.140	2.011	1.089	1006.4	1.019	3.367
89000	89180	422.10	−37.57	19.31	6.114	1.143	1.920	1.090	1007.2	1.020	3.372
90000	90186	422.76	−36.91	19.42	5.849 − 1	1.145	1.834 − 3	1.092	1008.0	1.021 − 5	3.377 − 6
91000	91193	423.42	−36.25	19.53	5.596	1.148	1.752	1.095	1008.7	1.023	3.382
92000	92199	424.08	−35.59	19.63	5.354	1.150	1.673	1.097	1009.5	1.024	3.387
93000	93206	424.74	−34.93	19.74	5.122	1.153	1.599	1.099	1010.3	1.025	3.391
94000	94213	425.40	−34.27	19.85	4.901	1.155	1.527	1.101	1011.1	1.027	3.396
95000	95219	426.05	−33.62	19.96	4.690	1.157	1.459	1.103	1011.9	1.028	3.401
96000	96226	426.71	−32.96	20.07	4.488	1.160	1.394	1.106	1012.7	1.029	3.406
97000	97233	427.37	−32.30	20.18	4.296	1.163	1.332	1.108	1013.4	1.030	3.411
98000	98240	428.03	−31.64	20.29	4.112	1.165	1.273	1.110	1014.2	1.032	3.416

TABLE 5.2.—*Continued*
75° N. July

GEOMETRIC ALTITUDE, ENGLISH UNITS

Altitude		Temperature			Pressure		Density		Sound speed	Coefficient of viscosity	Thermal conductivity
Z, ft	H, ft	T, °R	t, °F	$T-T_{std}$	P, in. Hg	$\frac{P}{P_{std}}$	ρ, lb ft^{-3}	$\frac{\rho}{\rho_{std}}$	C_s, ft sec^{-1}	μ, lb ft^{-1} sec^{-1}	$\frac{k}{}$, BTU ft^{-1} sec^{-1} (°R)$^{-1}$
80000	79874	416.10	-43.57	18.40	9.197 - 1	1.112	2.930 - 3	1.062	1000.0	1.008 - 5	3.328 - 6
81000	80868	416.75	-42.92	18.51	8.796	1.114	2.797	1.064	1000.8	1.009	3.332
82000	81863	417.41	-42.26	18.62	8.410	1.116	2.671	1.066	1001.6	1.011	3.337
83000	82857	418.06	-41.61	18.73	8.043	1.118	2.550	1.068	1002.3	1.012	3.342
84000	83851	418.72	-40.95	18.84	7.692	1.120	2.435	1.070	1003.1	1.013	3.347
85000	84845	419.37	-40.30	18.95	7.358	1.123	2.326	1.072	1003.9	1.015	3.352
86000	85840	420.02	-39.65	19.07	7.038	1.125	2.221	1.074	1004.7	1.016	3.357
87000	86834	420.68	-38.99	19.18	6.733	1.127	2.122	1.076	1005.5	1.017	3.362
88000	87827	421.33	-38.34	19.29	6.442	1.130	2.027	1.078	1006.3	1.019	3.366
89000	88821	421.99	-37.68	19.40	6.163	1.132	1.936	1.080	1007.0	1.020	3.371
90000	89815	422.64	-37.03	19.51	5.897 - 1	1.134	1.850 - 3	1.082	1007.8	1.021 - 5	3.376 - 6
91000	90809	423.30	-36.37	19.62	5.643	1.136	1.767	1.084	1008.6	1.022	3.381
92000	91802	423.95	-35.72	19.73	5.401	1.139	1.689	1.086	1009.4	1.024	3.386
93000	92796	424.60	-35.07	19.84	5.169	1.141	1.614	1.087	1010.1	1.025	3.390
94000	93789	425.26	-34.41	19.95	4.947	1.143	1.542	1.090	1010.9	1.026	3.395
95000	94782	425.91	-33.76	20.06	4.735	1.146	1.474	1.092	1011.7	1.028	3.400
96000	95775	426.57	-33.10	20.17	4.533	1.148	1.409	1.094	1012.5	1.029	3.405
97000	96768	427.22	-32.45	20.28	4.340	1.150	1.347	1.096	1013.3	1.030	3.410
98000	97761	427.87	-31.80	20.39	4.155	1.153	1.287	1.098	1014.0	1.031	3.415

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Table 5.3

Sea level to 30 km

GEOPOTENTIAL ALTITUDE IN METERS AS A FUNCTION OF PRESSURE IN MILLIBARS

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TABLE 5.3

GEOPOTENTIAL ALTITUDE IN METERS AS A FUNCTION OF PRESSURE IN MILLIBARS

P, mb	Pressure Altitude*	75° N. Jan	60° N. Jan	45° N. Jan	30° N. Jan	15° N. Annual	30° N. July	45° N. July	60° N. July	75° N. July
10	31850	29320	30019	30944	30878	31151	31452	31786	31915	
11	30620	28199	29420	29814	30227	30500	30798	31125	31252	
12	29543	28212	28873	29382	29694	29904	30206	30523	30649	
13	28553	27326	28369	28872	29107	29362	29661	29976	30095	
14	27623	27275	27905	28404	28617	28859	29136	29471	29583	29633
15	26760	26856	27471	27966	28161	28397	28694	29000	29109	29351
16	25963	26462	27070	27559	27735	27956	28262	28563	28668	28904
17	25265	26095	26692	27177	27337	27559	27858	28153	28254	28484
18	24578	25748	26335	26816	26946	27181	27478	27769	27863	28091
19	23916	25420	25997	26477	26612	26823	27118	27408	27496	27718
20	23281	25108	25680	26143	26279	26484	26778	27063	27150	27365
21	22673	24811	25378	25834	25968	26164	26456	26739	26821	27029
22	22090	24528	25069	25554	25682	25859	26151	26430	26506	26711
23	21532	24256	24814	25276	25378	25568	25859	26135	26206	26407
24	20994	24000	24551	25005	25101	25291	25581	25852	25919	26116
25	20479	23751	24299	24748	24839	25028	25314	25582	25646	25837
26	19984	23512	24057	24500	24580	24771	25058	25322	25383	25570
27	19510	23283	23823	24262	24347	24526	24812	25073	25130	25314
28	19056	23062	23597	24036	24118	24292	24576	24836	24887	25067	
29	18620	22849	23379	23813	23896	24066	24350	24603	24653	24829
30	18203	22642	23168	23600	23677	23849	24132	24381	24427	24599
31	17803	22443	22964	23394	23468	23639	23921	24165	24209	24377
32	17422	22251	22766	23194	23270	23436	23716	23957	23998	24163
33	17056	22064	22575	23000	23076	23239	23518	23755	23796	23955
34	16706	21882	22389	22812	22888	23049	23326	23559	23597	23753
35	16370	21706	22208	22629	22705	22864	23141	23370	23405	23558
36	16049	21534	22033	22451	22528	22686	22961	23186	23220	23368
37	15742	21367	21862	22279	22356	22514	22785	23007	23039	23183
38	15447	21206	21697	22111	22190	22343	22616	22834	22863	23004
39	15165	21048	21535	21948	22027	22179	22451	22665	22692	22829
40	14895	20894	21377	21788	21870	22019	22291	22500	22525	22658
41	14636	20744	21222	21632	21716	21864	22134	22340	22362	22492
42	14388	20598	21071	21480	21566	21713	21982	22183	22203	22329
43	14151	20455	20924	21332	21420	21565	21833	22030	22047	22170
44	13924	20315	20780	21188	21278	21422	21688	21881	21896	22015
45	13707	20178	20640	21046	21139	21283	21546	21735	21748	21864
46	13499	20045	20503	20908	21003	21146	21408	21592	21604	21716
47	13300	19914	20368	20772	20870	21013	21272	21453	21462	21571
48	13110	19786	20236	20640	20741	20884	21140	21317	21323	21429
49	12928	19660	20107	20510	20614	20757	21010	21184	21187	21291
50	12753	19538	19980	20383	20490	20633	20884	21054	21054	21154
51	12586	19417	19856	20258	20369	20511	20760	20926	20923	21021
52	12427	19299	19734	20136	20251	20392	20639	20801	20796	20890
53	12274	19183	19615	20015	20136	20276	20520	20678	20670	20762
54	12128	19069	19498	19898	20020	20163	20404	20557	20547	20636
55	11987	18958	19382	19782	19909	20051	20289	20439	20426	20512
56	11853	18848	19269	19669	19799	19942	20177	20323	20307	20391
57	11724	18741	19158	19557	19692	19835	20067	20210	20191	20271
58	11600	18635	19049	19448	19586	19730	19959	20098	20076	20154
59	11482	18531	18941	19340	19480	19627	19854	19988	19963	20039
60	11369	18428	18836	19235	19381	19525	19750	19880	19852	19926
61	11259	18328	18732	19131	19281	19426	19647	19774	19744	19814
62	11154	18229	18629	19028	19183	19329	19547	19670	19637	19705
63	11053	18131	18529	18928	19087	19233	19448	19568	19531	19597
64	10955	18035	18430	18828	18992	19139	19351	19467	19428	19492
65	10862	17941	18332	18730	18898	19046	19256	19366	19325	19387
66	10771	17847	18235	18634	18807	18955	19162	19270	19225	19284
67	10684	17755	18141	18539	18717	18866	19069	19174	19126	19183
68	10600	17665	18047	18446	18628	18779	18978	19079	19028	19083
69	10519	17576	17955	18354	18540	18692	18889	18988	18932	18984
70	10442	17488	17864	18263	18454	18607	18801	18894	18837	18887
71	10367	17401	17775	18174	18369	18523	18714	18804	18743	18792
72	10293	17315	17687	18085	18286	18441	18628	18715	18651	18697
73	10222	17231	17600	17998	18203	18360	18544	18627	18560	18604
74	10153	17148	17514	17912	18122	18281	18460	18540	18471	18513
75	10086	17066	17430	17827	18042	18202	18379	18455	18382	18422
76	17920	16985	17346	17744	17963	18124	18298	18371	18295	18333
77	17837	16905	17263	17661	17885	18048	18218	18287	18208	18245
78	17755	16826	17181	17580	17809	17972	18140	18205	18123	18159
79	17675	16748	17101	17499	17733	17899	18062	18124	18039	18073
80	17595	16671	17021	17420	17658	17826	17986	18044	17956	17988
81	17516	16595	16943	17341	17584	17754	17910	17966	17874	17904
82	17438	16519	16865	17264	17512	17682	17836	17888	17794	17822
83	17361	16445	16789	17187	17440	17612	17762	17811	17714	17740
84	17285	16371	16713	17111	17368	17543	17690	17735	17635	17659
85	17210	16299	16638	17036	17296	17474	17618	17660	17557	17580
86	17136	16227	16564	16962	17225	17407	17547	17586	17480	17501
87	17063	16156	16491	16889	17160	17341	17477	17513	17404	17423
88	16990	16085	16419	16817	17092	17275	17408	17441	17329	17346
89	16919	16016	16347	16745	17025	17210	17340	17369	17254	17270
90	16848	15947	16276	16675	16958	17146	17273	17299	17181	17194
91	16778	15879	16206	16605	16892	17083	17206	17229	17108	17120
92	16708	15812	16137	16536	16827	17020	17140	17160	17036	17046
93	16640	15745	16068	16467	16762	16958	17075	17091	16966	16973
94	16572	15679	16001	16399	16699	16897	17011	17024	16896	16901
95	16505	15614	15933	16332	16635	16837	16948	16957	16826	16830
96	16439	15550	15867	16266	16573	16778	16885	16890	16755	16759
97	16373	15486	15801	16200	16511	16719	16823	16825	16687	16690
98	16308	15423	15736	16135	16449	16660	16762	16760	16619	16621
99	16243	15361	15671	16070	16388	16603	16702	16695	16552	16552
100	16180	15299	15607	16006	16328	16545	16642	16632	16486	16485
101	16117	15238	15544	15943	16268	16488	16582	16569	16421	16418
102	16054	15178	15481	15881	16209	16432	16523	16506	16356	16352
103	15992	15118	15420	15819	16150	16376	16465	16444	16292	16287
104	15931	15059	15359	15757	16092	16321	16407	16383	16229	16222
105	15870	15000	15299	15697	16034	16266	16350	16323	16166	16158
106	15810	14941	15239	15636	15977	16212	16293	16263	16104	16094
107	15751	14883	15180	15577	15920	16158	16236	16204	16043	16031
108	15692	14825	15121	15518	15864	16105	16181	16145	15981	15968
109	15633	14766	15063	15459	15808	16052	16125	16086	15920	15906

*Pressure altitude is defined as the indicated altitude of a pressure altimeter when the altimeter is set at 1013.25 mb and calibrated with the Standard Atmosphere.

TABLE 5.3.—*Continued*

GEOPOTENTIAL ALTITUDE IN METERS AS A FUNCTION OF PRESSURE IN MILLIBARS

P, mb	Pressure altitude*	75° N. Jan	60° N. Jan	45° N. Jan	30° N. Jan	15° N. Annual	30° N. July	45° N. July	60° N. July	75° N. July
110	15375	14731	15006	15401	15783	16000	16070	16049	15859	15866
111	15318	14695	14968	15344	15698	15948	16016	15972	15789	15782
112	15261	14599	14881	15287	15646	15896	15963	15916	15739	15721
113	15205	14564	14835	15231	15590	15845	15910	15860	15680	15661
114	15149	14489	14778	15175	15537	15795	15858	15803	15622	15601
115	15093	14435	14723	15120	15484	15745	15806	15750	15565	15541
116	15038	14382	14668	15065	15432	15695	15755	15696	15508	15483
117	14984	14329	14613	15011	15380	15645	15704	15643	15449	15425
118	14930	14276	14559	14957	15329	15597	15654	15589	15394	15369
119	14877	14224	14505	14903	15278	15548	15604	15537	15338	15312
120	14823	14172	14452	14850	15227	15500	15554	15484	15283	15256
121	14771	14121	14399	14797	15177	15451	15505	15431	15229	15201
122	14719	14070	14346	14745	15127	15[illegible]	15456	15379	15175	15146
123	14667	14020	14294	14693	15078	15[illegible]	15407	15327	15121	15092
124	14616	13970	14243	14642	15029	15[illegible]	15359	15276	15068	15038
125	14565	13920	14191	14591	14980	15259	15311	15225	15016	14984
126	14514	13870	14140	14540	14932	15212	15264	15174	14963	14930
127	14464	13821	14090	14490	14883	15165	15217	15124	14911	14877
128	14414	13772	14040	14440	14835	15119	15170	15074	14860	14824
129	14363	13723	13990	14390	14787	15073	15123	15025	14809	14771
130	14313	13675	13941	14340	14740	15027	15077	14976	14758	14719
131	14263	13627	13892	14291	14693	14982	15032	14927	14707	14668
132	14214	13580	13843	14243	14647	14938	14988	14880	14657	14616
133	14165	13533	13795	14194	14600	14893	14941	14832	14608	14566
134	14116	13486	13747	14146	14553	14849	14897	14785	14559	14515
135	14067	13440	13700	14099	14509	14805	14852	14738	14510	14465
136	14018	13395	13653	14052	14466	14761	14808	14692	14461	14415
137	13969	13350	13606	14005	14418	14717	14764	14645	14412	14365
138	13921	13305	13558	13958	14373	14674	14721	14600	14364	14316
139	13873	13260	13511	13912	14329	14631	14678	14554	14316	14267
140	13824	13216	13468	13867	14285	14588	14635	14509	14269	14219
141	13776	13172	13424	13821	14241	14545	14592	14464	14222	14171
142	13728	13129	13379	13776	14197	14502	14550	14420	14175	14123
143	13681	13086	13335	13732	14154	14459	14508	14376	14128	14075
144	13633	13043	13291	13687	14111	14416	14466	14332	14082	14028
145	13585	13000	13247	13643	14068	14374	14424	14288	14036	13981
146	13538	12957	13204	13600	14025	14327	14382	14245	13991	13935
147	13537	12915	13161	13556	13983	14286	14340	14202	13946	13889
148	13494	12872	13118	13513	13941	14245	14298	14159	13901	13843
149	13451	12830	13076	13470	13899	14204	14257	14117	13857	13797
150	13408	12789	13034	13427	13858	14163	14216	14075	13813	13752
151	13366	12747	12992	13385	13816	14123	14176	14033	13769	13707
152	13324	12706	12949	13343	13775	14083	14135	13992	13726	13663
153	13283	12665	12908	13301	13735	14043	14095	13950	13683	13618
154	13242	12624	12866	13260	13694	14004	14055	13909	13640	13574
155	13200	12584	12825	13218	13654	13964	14016	13868	13597	13530
156	13160	12544	12784	13177	13614	13924	13976	13828	13555	13487
157	13119	12504	12743	13137	13575	13884	13936	13787	13513	13444
158	13079	12464	12703	13096	13535	13845	13897	13747	13471	13402
159	13039	12425	12662	13056	13496	13805	13857	13707	13429	13360
160	13199	12386	12622	13016	13457	13766	13818	13668	13388	13318
161	13160	12347	12583	12976	13418	13728	13780	13628	13347	13276
162	13120	12308	12543	12937	13380	13689	13741	13589	13306	13235
163	13081	12270	12504	12898	13342	13651	13703	13550	13265	13194
164	13043	12232	12465	12859	13303	13613	13665	13512	13225	13153
165	13004	12194	12426	12820	13266	13575	13627	13473	13185	13112
166	12966	12156	12388	12781	13228	13537	13589	13435	13145	13072
167	12928	12118	12349	12743	13191	13500	13552	13397	13106	13032
168	12890	12081	12311	12705	13154	13462	13515	13359	13066	12992
169	12852	12044	12273	12667	13117	13425	13478	13321	13027	12952
170	12815	12007	12236	12630	13080	13388	13440	13284	12988	12912
171	12777	11971	12198	12592	13043	13351	13403	13247	12950	12872
172	12740	11934	12161	12555	13007	13314	13367	13210	12911	12833
173	12704	11898	12124	12518	12971	13276	13330	13173	12873	12794
174	12667	11862	12087	12482	12935	13241	13294	13137	12835	12755
175	12631	11826	12051	12445	12899	13205	13258	13101	12798	12716
176	12595	11791	12014	12408	12863	13169	13222	13064	12760	12678
177	12559	11756	11979	12372	12828	13134	13186	13029	12723	12640
178	12523	11720	11943	12336	12792	13098	13150	12993	12686	12602
179	12488	11685	11907	12300	12757	13063	13115	12957	12649	12564
180	12452	11651	11872	12265	12722	13028	13080	12922	12612	12526
181	12417	11616	11837	12229	12688	12993	13045	12887	12576	12489
182	12382	11582	11802	12194	12653	12958	13010	12852	12540	12452
183	12347	11548	11768	12159	12619	12923	12975	12817	12504	12415
184	12313	11514	11733	12124	12585	12888	12941	12783	12468	12379
185	12278	11480	11699	12089	12551	12853	12906	12748	12432	12342
186	12244	11446	11665	12055	12517	12819	12871	12714	12396	12306
187	12210	11412	11631	12020	12483	12784	12837	12680	12361	12270
188	12176	11379	11597	11986	12450	12750	12803	12647	12326	12235
189	12143	11345	11563	11952	12416	12716	12769	12613	12291	12199
190	12109	11312	11530	11918	12383	12683	12735	12580	12256	12164
191	12076	11279	11497	11885	12350	12649	12701	12546	12221	12129
192	12043	11247	11463	11851	12317	12616	12668	12513	12187	12094
193	12010	11214	11430	11818	12284	12582	12635	12480	12152	12059
194	11977	11182	11397	11785	12252	12549	12602	12446	12118	12024
195	11945	11149	11365	11752	12219	12516	12569	12413	12084	11990
196	11912	11117	11332	11719	12187	12483	12536	12380	12050	11955
197	11880	11085	11300	11686	12155	12451	12503	12347	12017	11921
198	11848	11054	11268	11654	12123	12418	12470	12314	11983	11887
199	11816	11022	11235	11621	12091	12385	12438	12281	11950	11854
200	11784	10991	11204	11589	12060	12353	12405	12248	11917	11820
205	11627	10835	11046	11431	11903	12193	12245	12088	11755	11655
210	11475	10684	10893	11277	11750	12037	12089	11931	11596	11494
215	11325	10538	10744	11127	11600	11883	11935	11777	11442	11337
220	11180	10394	10598	10980	11453	11732	11783	11627	11290	11185
225	11037	10253	10455	10835	11307	11584	11634	11479	11142	11035
230	10898	10114	10316	10694	11164	11439	11488	11334	10997	10888
235	10760	9976	10179	10555	11025	11295	11343	11192	10856	10744
240	10626	9840	10045	10419	10887	11154	11202	11052	10717	10604
245	10493	9719	9914	10287	10753	11016	11063	10916	10580	10468

*Pressure altitude is defined as the indicated altitude of pressure altimeter when the altimeter is set at 1013.25 mb and calibrated with the Standard Atmosphere.

TABLE 5.3.—*Continued*

GEOPOTENTIAL ALTITUDE IN METERS AS A FUNCTION OF PRESSURE IN MILLIBARS

P, mb	Pressure altitude*	75° N. Jan	60° N. Jan	45° N. Jan	30° N. Jan	15° N. Annual	30° N. July	45° N. July	60° N. July	75° N. July
250	10363	9502	9785	10152	10420	10879	10926	10777	10447	10334
255	10235	9468	9660	10018	10298	10745	10792	10644	10317	10203
260	10109	9396	9537	9905	10261	10613	10660	10513	10189	10076
265	9984	9324	9415	9787	10135	10482	10531	10383	10064	9947
270	9862	9109	9295	9661	10109	10356	10402	10255	9941	9823
275	9741	8993	9179	9542	9985	10230	10275	10130	9819	9702
280	9623	8879	9064	9425	9864	10105	10150	10007	9700	9582
285	9505	8768	8953	9309	9745	9983	10027	9885	9582	9465
290	9390	8658	8842	9195	9627	9862	9905	9766	9465	9350
295	9276	8551	8733	9082	9511	9743	9786	9649	9350	9236
300	9164	8445	8626	8971	9398	9625	9667	9528	9236	9124
305	9053	8341	8521	8862	9285	9509	9551	9413	9125	9013
310	8944	8238	8417	8754	9174	9394	9436	9299	9015	8903
315	8836	8136	8315	8647	9063	9281	9322	9187	8906	8795
320	8729	8036	8214	8542	8954	9170	9210	9075	8799	8688
325	8624	7937	8114	8438	8847	9061	9099	8965	8692	8583
330	8520	7839	8016	8335	8742	8952	8989	8857	8587	8479
335	8418	7742	7919	8234	8636	8844	8881	8750	8483	8377
340	8316	7647	7823	8134	8533	8737	8775	8645	8381	8276
345	8216	7552	7729	8035	8431	8632	8669	8541	8280	8176
350	8117	7459	7635	7938	8330	8529	8564	8438	8180	8076
355	8019	7367	7542	7841	8230	8427	8461	8335	8082	7978
360	7923	7277	7450	7744	8132	8326	8359	8234	7984	7882
365	7827	7187	7359	7652	8035	8226	8258	8134	7887	7786
370	7732	7099	7270	7559	7938	8126	8158	8035	7792	7691
375	7639	7012	7181	7467	7842	8027	8060	7938	7697	7598
380	7546	6925	7093	7376	7746	7930	7963	7841	7603	7505
385	7455	6840	7007	7286	7651	7835	7865	7746	7511	7414
390	7364	6755	6921	7196	7562	7740	7769	7651	7419	7323
395	7274	6671	6836	7108	7471	7646	7674	7558	7328	7234
400	7185	6587	6752	7021	7380	7552	7580	7465	7237	7144
405	7098	6505	6668	6934	7291	7460	7487	7374	7149	7056
410	7011	6424	6585	6848	7202	7369	7395	7284	7061	6969
415	6924	6343	6503	6763	7114	7279	7304	7194	6974	6882
420	6839	6264	6422	6680	7028	7189	7214	7104	6887	6797
425	6754	6185	6342	6597	6941	7100	7125	7016	6801	6713
430	6671	6107	6263	6515	6855	7012	7037	6928	6716	6629
435	6588	6029	6184	6433	6770	6925	6949	6842	6632	6546
440	6506	5953	6106	6352	6686	6839	6862	6757	6549	6464
445	6424	5877	6029	6272	6603	6753	6776	6672	6467	6383
450	6344	5802	5952	6193	6521	6669	6690	6588	6385	6303
455	6264	5728	5876	6115	6440	6585	6605	6505	6303	6223
460	6184	5654	5801	6037	6359	6502	6522	6422	6223	6143
465	6106	5581	5726	5960	6279	6419	6438	6341	6143	6064
470	6028	5509	5652	5883	6199	6337	6356	6260	6064	5986
475	5951	5437	5578	5807	6121	6256	6274	6179	5986	5909
480	5874	5365	5506	5732	6043	6176	6193	6098	5908	5833
485	5798	5295	5434	5657	5966	6098	6112	6019	5831	5757
490	5723	5225	5363	5583	5889	6017	6032	5941	5755	5682
495	5648	5155	5292	5510	5812	5939	5953	5863	5678	5607
500	5574	5086	5222	5437	5736	5861	5874	5787	5603	5532
510	5428	4950	5082	5294	5588	5707	5719	5636	5454	5386
520	5284	4817	4945	5153	5441	5557	5566	5488	5308	5243
530	5142	4686	4810	5014	5296	5407	5416	5336	5163	5101
540	5003	4556	4677	4877	5154	5260	5269	5190	5021	4961
550	4865	4429	4546	4742	5014	5115	5123	5047	4882	4823
560	4730	4303	4417	4609	4875	4973	4980	4905	4745	4688
570	4596	4180	4290	4479	4739	4833	4838	4767	4608	4554
580	4464	4058	4165	4350	4605	4695	4699	4629	4475	4422
590	4335	3938	4041	4223	4472	4558	4562	4495	4342	4292
600	4206	3819	3919	4098	4342	4423	4427	4361	4212	4164
610	4080	3702	3799	3976	4213	4290	4294	4230	4084	4038
620	3955	3587	3680	3852	4085	4158	4162	4100	3957	3912
630	3832	3474	3563	3732	3960	4029	4034	3972	3832	3789
640	3711	3362	3447	3613	3836	3901	3906	3846	3709	3667
650	3591	3251	3333	3495	3713	3775	3778	3721	3588	3547
660	3472	3142	3221	3379	3592	3650	3653	3598	3468	3429
670	3355	3034	3110	3265	3472	3527	3529	3478	3349	3311
680	3239	2928	3000	3152	3354	3405	3407	3356	3232	3196
690	3125	2823	2892	3041	3237	3285	3287	3237	3117	3081
700	3012	2719	2785	2930	3122	3165	3168	3119	3002	2968
710	2901	2616	2680	2821	3008	3048	3050	3003	2890	2856
720	2790	2514	2576	2714	2895	2931	2934	2889	2779	2746
730	2681	2414	2473	2608	2784	2816	2819	2776	2668	2636
740	2573	2315	2371	2503	2674	2702	2706	2664	2559	2528
750	2466	2217	2271	2399	2565	2589	2593	2553	2452	2421
760	2361	2120	2172	2297	2457	2478	2482	2443	2345	2316
770	2256	2024	2074	2195	2350	2368	2372	2335	2239	2211
780	2153	1929	1978	2095	2244	2260	2264	2227	2135	2108
790	2050	1835	1882	1996	2139	2152	2156	2121	2032	2006
800	1949	1743	1787	1898	2036	2045	2050	2016	1930	1905
810	1849	1651	1694	1802	1933	1940	1944	1911	1829	1805
820	1749	1560	1602	1706	1832	1836	1840	1808	1729	1707
830	1651	1470	1511	1612	1732	1732	1738	1706	1630	1610
840	1554	1381	1420	1519	1632	1630	1635	1606	1532	1513
850	1457	1294	1331	1426	1534	1529	1534	1506	1435	1418
860	1362	1207	1242	1334	1437	1429	1434	1407	1339	1324
870	1267	1121	1154	1244	1341	1330	1335	1309	1244	1230
880	1173	1037	1068	1154	1246	1231	1236	1212	1150	1138
890	1081	953	982	1064	1152	1134	1139	1116	1056	1047
900	988	871	897	976	1059	1037	1042	1021	964	957
910	897	790	814	889	967	942	946	926	872	867
920	807	709	731	803	875	847	851	833	782	779
930	717	630	649	718	785	753	757	741	692	691
940	628	551	568	633	695	659	664	649	602	605
950	540	474	488	550	606	567	571	558	514	519
960	453	397	409	467	518	475	480	468	427	434
970	366	321	331	384	431	384	389	379	340	349
980	281	246	253	303	345	295	298	290	254	266
990	195	171	177	222	260	205	209	203	169	183

*Pressure altitude is defined as the indicated altitude of pressure altimeter when the altimeter is set at 1013.25 mb and calibrated with the Standard Atmosphere.

TABLE 5.3.—*Continued*

GEOPOTENTIAL ALTITUDE IN METERS AS A FUNCTION OF PRESSURE IN MILLIBARS

P, mb	Pressure altitude*	75° N. Jan	60° N. Jan	45° N. Jan	30° N. Jan	15° N. Annual	30° N. July	45° N. July	60° N. July	75° N. July
1000	111	98	101	142	175	116	119	116	89	101
1010	27	25	26	43	91	28	91	30		20

*Pressure altitude is defined as the indicated altitude of pressure altimeter when the altimeter is set at 1013.25 mb and calibrated with the Standard Atmosphere.

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Table 5.4

Sea level to 100,000 ft

GEOPOTENTIAL ALTITUDE IN FEET AS A FUNCTION OF PRESSURE IN MILLIBARS

TABLE 5.4

GEOPOTENTIAL ALTITUDE IN FEET AS A FUNCTION OF PRESSURE IN MILLIBARS

P, mb	Pressure altitude*	75° N. Jan	60° N. Jan	45° N. Jan	30° N. Jan	15° N. Annual	30° N. July	45° N. July	60° N. July	75° N. July
10	101886	96194	98488	00210	101273	102201	103189	104285	104708	
11	99801	94288	96522	98215	99170	100066	101063	102116	102533	
12	97910	92559	94726	96398	97257	98110	99101	100141	100554	
13	96171	90985	93074	94724	95495	96342	97318	98340	98737	
14	94564	89485	91552	93189	93888	94682	95663	96690	97057	97817
15	93071	88110	90126	91752	92392	93166	94140	95149	95502	96296
16	91677	86816	88812	90417	90996	91752	92723	93711	94055	94829
17	90371	85594	87572	89160	89688	90417	91398	92365	92697	93451
18	89140	84435	86401	87979	88465	89177	90151	91106	91414	92162
19	87979	83339	85292	86867	87330	88002	88970	89921	90210	90938
20	86880	82375	84252	85804	86217	86890	87854	88789	89075	89780
21	85837	81401	83261	84797	85180	85840	86798	87726	87995	88678
22	84843	80472	82313	83839	84193	84839	85797	86713	86962	87635
23	83891	79587	81411	82920	83255	83885	84834	85745	85978	86637
24	82986	78740	80568	82037	82352	82976	83927	84816	85038	85682
25	82116	77928	79721	81194	81493	82106	83051	83930	84140	84767
26	81280	77139	78927	80381	80669	81270	82211	83077	83278	83891
27	80479	76386	78159	79600	79879	80466	81404	82260	82446	83051
28	79705	75663	77418	78852	79117	79698	80630	81476	81650	82241
29	78963	74964	76703	78127	78386	78957	79888	80719	80883	81460
30	78245	74285	76010	77428	77680	78245	79173	79990	80141	80705
31	77549	73632	75341	76752	76998	77556	78481	79281	79426	79977
32	76877	73002	74692	76098	76345	76890	77808	78599	78734	79275
33	76227	72388	74065	75459	75709	76243	77159	77936	78064	78593
34	75597	71791	73455	74843	75092	75620	76529	77293	77418	77930
35	74987	71214	72861	74242	74491	75013	75922	76673	76788	77290
36	74393	70650	72287	73658	73911	74429	75331	76070	76181	76667
37	73816	70102	71726	73094	73346	73858	74757	75482	75587	76060
38	73255	69573	71184	72543	72802	73304	74199	74915	75010	75472
39	72710	69055	70653	72008	72267	72766	73658	74360	74449	74898
40	72178	68550	70135	71483	71752	72241	73133	73819	73901	74337
41	71660	68058	69626	70971	71247	71732	72618	73294	73366	73793
42	71155	67579	69131	70472	70755	71237	72119	72779	72844	73258
43	70659	67110	68648	69987	70276	70751	71631	72277	72335	72736
44	70177	66650	68176	69514	69810	70282	71155	71788	71837	72228
45	69708	66201	67717	69049	69354	69826	70689	71309	71352	71732
46	69249	65764	67267	68596	68907	69377	70236	70840	70879	71247
47	68799	65335	66824	68150	68471	68940	69790	70384	70413	70771
48	68360	64915	66391	67717	68048	68517	69357	69938	69957	70305
49	67930	64501	65968	67290	67631	68100	68930	69501	69511	69852
50	67507	64101	65551	66873	67224	67694	68517	69075	69075	69403
51	67093	63704	65144	66463	66827	67293	68110	68655	68645	68967
52	66690	63317	64744	66063	66440	66903	67713	68245	68228	68537
53	66293	62936	64354	65666	66056	66522	67323	67841	67815	68117
54	65902	62562	63970	65282	65682	66152	66962	67444	67411	67703
55	65522	62198	63589	64902	65318	65784	66565	67057	67014	67297
56	65148	61837	63219	64531	64957	65427	66198	66677	66624	66900
57	64777	61486	62854	64163	64606	65075	65837	66306	66243	66506
58	64416	61138	62497	63806	64259	64731	65482	65938	65866	66122
59	64062	60797	62142	63451	63921	64393	65138	65577	65495	65745
60	63711	60459	61798	63107	63586	64058	64797	65223	65131	65374
61	63366	60131	61457	62766	63258	63734	64459	64875	64777	65007
62	63024	59806	61119	62428	62936	63415	64131	64534	64426	64649
63	62697	59485	60791	62100	62621	63100	63806	64199	64078	64295
64	62369	59170	60466	61772	62310	62792	63488	63868	63740	63950
65	62047	58862	60144	61450	62001	62487	63176	63543	63402	63606
66	61729	58553	59826	61135	61703	62188	62867	63222	63074	63268
67	61414	58251	59518	60823	61407	61896	62562	62907	62749	62936
68	61106	57956	59209	60518	61115	61611	62264	62595	62428	62608
69	60804	57664	58907	60217	60827	61325	61972	62290	62113	62283
70	60505	57375	58609	59918	60545	61047	61683	61988	61801	61965
71	60210	57090	58317	59626	60266	60771	61398	61693	61493	61654
72	59918	56808	58028	59334	59993	60502	61115	61401	61191	61342
73	59629	56532	57743	59049	59721	60236	60840	61112	60892	61037
74	59347	56260	57461	58766	59455	59977	60564	60827	60600	60738
75	59068	55991	57185	58488	59193	59718	60299	60548	60308	60440
76	58793	55725	56909	58215	58934	59462	60033	60272	60023	60148
77	58520	55463	56637	57943	58678	59213	59770	59997	59738	59859
78	58251	55203	56368	57677	58428	58963	59514	59728	59459	59577
79	57989	54948	56106	57411	58179	58724	59259	59462	59183	59295
80	57726	54695	55843	57152	57933	58484	59009	59199	58911	59016
81	57467	54446	55587	56893	57690	58248	58760	58944	58642	58740
82	57211	54196	55331	56640	57454	58012	58517	58688	58379	58471
83	56959	53953	55082	56388	57218	57782	58274	58435	58117	58202
84	56709	53711	54833	56138	56982	57556	58038	58186	57858	57936
85	56463	53474	54587	55892	56752	57329	57802	57940	57602	57677
86	56220	53238	54344	55650	56522	57110	57569	57697	57349	57418
87	55981	53005	54104	55410	56299	56893	57339	57457	57100	57162
88	55741	52772	53868	55174	56076	56677	57113	57221	56854	56909
89	55509	52546	53632	54938	55856	56463	56890	56985	56606	56660
90	55276	52320	53399	54708	55636	56253	56670	56755	56368	56411
91	55046	52096	53169	54478	55420	56047	56450	56526	56129	56168
92	54816	51877	52943	54252	55207	55840	56234	56299	55892	55925
93	54593	51657	52717	54026	54993	55636	56020	56073	55656	55686
94	54370	51440	52497	53802	54787	55430	55810	55853	55427	55449
95	54150	51227	52274	53583	54577	55240	55604	55633	55197	55217
96	53934	51017	52057	53366	54373	55046	55397	55413	54970	54984
97	53717	50807	51841	53150	54170	54852	55194	55200	54747	54757
98	53504	50600	51627	52936	53967	54659	54993	54987	54524	54531
99	53291	50397	51414	52723	53766	54472	54797	54774	54304	54304
100	53084	50194	51204	52513	53570	54281	54600	54567	54088	54085
101	52877	49993	50997	52306	53373	54098	54403	54360	53875	53865
102	52671	49797	50791	52103	53179	53911	54209	54154	53661	53648
103	52467	49600	50591	51900	52986	53727	54019	53950	53451	53435
104	52267	49408	50390	51696	52795	53547	53829	53750	53245	53222
105	52067	49213	50194	51499	52605	53366	53642	53553	53038	53012
106	51870	49019	49997	51299	52418	53189	53455	53356	52835	52802
107	51677	48829	49803	51106	52231	53012	53268	53163	52635	52595
108	51483	48638	49610	50912	52047	52834	53087	52969	52431	52388
109	51289	48451	49419	50719	51864	52664	52904	52776	52231	52185

*Pressure altitude is defined as the indicated altitude of pressure altimeter when the altimeter is set at 1013.25 mb and calibrated with the Standard Atmosphere.

TABLE 5.4.—*Continued*

GEOPOTENTIAL ALTITUDE IN FEET AS A FUNCTION OF PRESSURE IN MILLIBARS

P, mb	Pressure altitude*	75° N. Jan	60° N. Jan	45° N. Jan	30° N. Jan	15° N. Annual	30° N. July	45° N. July	60° N. July	75° N. July
110	51094	48264	49232	50528	51683	52493	52723	52567	52031	51982
111	50912	48081	49042	50341	51503	52323	52546	52402	51834	51778
112	50725	47897	48855	50154	51325	52152	52372	52236	51637	51578
113	50541	47717	48671	49970	51148	52000	52198	52034	51444	51381
114	50358	47536	48484	49787	50974	51849	52028	51854	51253	51184
115	50174	47359	48304	49606	50801	51697	51857	51673	51060	50988
116	49993	47185	48123	49426	50630	51546	51690	51496	50873	50797
117	49816	47011	47943	49249	50459	51395	51522	51322	50686	50607
118	49639	46837	47766	49072	50292	51245	51358	51145	50505	50423
119	49465	46667	47589	48894	50125	51095	51194	50974	50322	50236
120	49288	46496	47415	48720	49957	50948	51030	50801	50141	50052
121	49117	46329	47241	48547	49793	50802	50869	50627	49964	49872
122	48947	46161	47067	48376	49629	50331	50709	50456	49787	49692
123	48776	45997	46896	48205	49469	50374	50548	50285	49610	49514
124	48609	45833	46729	48038	49308	50217	50390	50118	49436	49337
125	48442	45669	46558	47871	49147	50062	50233	49951	49265	49160
126	48274	45505	46391	47703	48990	49908	50079	49783	49091	48983
127	48110	45344	46227	47539	48829	49754	49925	49619	48921	48809
128	47946	45184	46063	47375	48671	49603	49770	49455	48753	48635
129	47785	45023	45899	47211	48514	49452	49616	49295	48586	48461
130	47625	44865	45738	47047	48360	49301	49465	49134	48419	48291
131	47464	44706	45577	46886	48205	49154	49318	48973	48251	48123
132	47306	44554	45417	46729	48054	49003	49167	48819	48087	47953
133	47149	44400	45259	46568	47900	48852	49019	48661	47927	47789
134	46995	44245	45104	46411	47753	48704	48875	48507	47766	47621
135	46841	44094	44948	46257	47602	48556	48727	48353	47605	47457
136	46686	43947	44793	46102	47454	48412	48583	48202	47444	47293
137	46532	43799	44639	45948	47303	48268	48438	48048	47283	47129
138	46381	43652	44488	45794	47156	48123	48297	47900	47126	46969
139	46230	43504	44337	45643	47011	47979	48156	47749	46969	46808
140	46083	43360	44186	45495	46867	47838	48015	47602	46814	46650
141	45935	43215	44042	45344	46722	47697	47874	47454	46660	46493
142	45787	43074	43894	45197	46578	47559	47736	47310	46506	46335
143	45640	42933	43750	45052	46437	47418	47598	47165	46352	46178
144	45495	42792	43606	44905	46296	47280	47461	47021	46201	46024
145	45351	42651	43461	44760	46155	47142	47323	46877	46050	45869
146	45210	42510	43320	44619	46014	47005	47185	46736	45902	45719
147	45069	42372	43179	44475	45876	46870	47047	46596	45755	45568
148	44928	42231	43038	44334	45738	46736	46909	46453	45607	45417
149	44787	42093	42900	44193	45600	46601	46775	46316	45463	45266
150	44646	41959	42762	44052	45466	46467	46640	46178	45318	45118
151	44508	41821	42625	43914	45328	46335	46509	46040	45174	44970
152	44370	41686	42484	43776	45197	46204	46375	45906	45033	44826
153	44236	41552	42349	43638	45062	46073	46243	45768	44892	44678
154	44101	41417	42211	43504	44928	45945	46112	45633	44751	44534
155	43963	41288	42077	43366	44797	45814	45984	45499	44610	44390
156	43832	41155	41942	43232	44665	45682	45853	45367	44472	44249
157	43698	41024	41808	43100	44537	45551	45722	45233	44334	44108
158	43566	40892	41677	42966	44406	45423	45594	45102	44196	43970
159	43435	40764	41542	42835	44278	45292	45463	44970	44056	43832
160	43304	40636	41411	42703	44150	45164	45335	44843	43924	43694
161	43176	40509	41283	42572	44022	45039	45210	44711	43789	43556
162	43045	40381	41152	42444	43894	44911	45082	44583	43655	43422
163	42917	40256	41024	42316	43773	44787	44957	44455	43520	43287
164	42792	40131	40896	42188	43645	44662	44833	44331	43389	43153
165	42664	40007	40768	42060	43524	44537	44708	44203	43258	43018
166	42539	39882	40643	41932	43399	44413	44583	44078	43127	42887
167	42415	39757	40515	41808	43278	44291	44462	43953	42999	42756
168	42290	39636	40390	41683	43156	44167	44341	43829	42867	42625
169	42165	39514	40266	41558	43035	44045	44219	43704	42740	42493
170	42044	39393	40144	41437	42913	43924	44096	43583	42612	42362
171	41919	39275	40020	41312	42792	43802	43973	43461	42487	42231
172	41798	39154	39898	41191	42674	43681	43855	43340	42359	42103
173	41680	39035	39777	41070	42556	43563	43734	43219	42234	41975
174	41558	38917	39656	40951	42438	43442	43615	43100	42110	41847
175	41440	38799	39537	40830	42320	43323	43497	42982	41988	41719
176	41322	38684	39416	40709	42201	43205	43379	42861	41864	41594
177	41204	38570	39301	40591	42087	43091	43261	42746	41742	41470
178	41086	38451	39183	40472	41969	42972	43143	42628	41621	41345
179	40971	38337	39065	40354	41854	42858	43028	42510	41499	41220
180	40853	38225	38950	40240	41739	42743	42913	42395	41378	41096
181	40738	38110	38835	40121	41627	42628	42799	42280	41260	40974
182	40623	37999	38720	40007	41512	42513	42684	42165	41142	40853
183	40509	37887	38609	39892	41401	42398	42569	42051	41024	40732
184	40397	37776	38496	39777	41289	42283	42457	41939	40906	40614
185	40282	37664	38383	39662	41178	42169	42343	41824	40787	40492
186	40171	37552	38271	39551	41066	42057	42228	41713	40669	40374
187	40059	37441	38159	39438	40955	41942	42116	41601	40554	40256
188	39948	37333	38048	39324	40846	41831	42005	41493	40440	40141
189	39839	37221	37936	39213	40735	41719	41893	41381	40325	40023
190	39728	37113	37828	39101	40627	41611	41781	41273	40210	39908
191	39619	37005	37720	38993	40518	41499	41670	41161	40095	39793
192	39511	36900	37608	38881	40410	41391	41562	41053	39984	39678
193	39403	36791	37500	38773	40302	41280	41453	40945	39869	39564
194	39295	36686	37392	38665	40197	41171	41345	40833	39757	39449
195	39190	36578	37287	38556	40089	41063	41237	40725	39646	39337
196	39081	36473	37178	38448	39984	40955	41129	40617	39534	39222
197	38976	36368	37073	38340	39879	40850	41020	40509	39426	39111
198	38871	36266	36969	38235	39774	40741	40912	40400	39314	38999
199	38766	36161	36860	38127	39669	40633	40807	40292	39206	38891
200	38661	36060	36759	38022	39567	40528	40699	40184	39098	38780
205	38146	35548	36240	37503	39052	40003	40174	39654	38566	38238
210	37644	35052	35738	36998	38550	39491	39662	39144	38045	37710
215	37156	34573	35249	36506	38058	38986	39157	38638	37539	37195
220	36680	34101	34770	36024	37575	38491	38658	38146	37041	36696
225	36211	33638	34301	35548	37096	38005	38169	37661	36555	36204
230	35755	33182	33845	35085	36627	37530	37690	37185	36079	35722
235	35302	32740	33396	34629	36171	37057	37215	36719	35617	35249
240	34862	32310	32958	34185	35719	36594	36752	36260	35161	34790
245	34426	31886	32526	33750	35279	36142	36296	35807	34711	34344

*Pressure altitude is defined as the indicated altitude of pressure altimeter when the altimeter is set at 1013.25 mb and calibrated with the Standard Atmosphere.

TABLE 5.4.—*Continued*

GEOPOTENTIAL ALTITUDE IN FEET AS A FUNCTION OF PRESSURE IN MILLIBARS

P, mb	Pressure altitude*	75° N. Jan	60° N. Jan	45° N. Jan	30° N. Jan	15° N. Annual	30° N. July	45° N. July	60° N. July	75° N. July
250	33999	31470	32103	33323	34843	35692	35846	35358	34275	32906
255	33579	31063	31693	32907	34416	35253	35407	34921	33868	33476
260	33166	30663	31289	32497	33993	34820	34974	34491	33428	33051
265	32756	30269	30889	32093	33579	34396	34551	34065	33018	32635
270	32350	29883	30495	31696	33166	33976	34127	33645	32615	32228
275	31959	29505	30115	31306	32759	33563	33711	33235	32219	31831
280	31572	29131	29741	30922	32362	33153	33301	32831	31824	31437
285	31184	28766	29373	30541	31972	32753	32897	32431	31437	31093
290	30807	28406	29009	30167	31585	32350	32497	32036	31053	30676
295	30433	28059	28652	29797	31206	31965	32106	31644	30676	30302
300	30066	27707	28301	29432	30833	31578	31716	31260	30302	29934
305	29701	27365	27956	29075	30463	31198	31335	30883	29938	29570
310	29344	27028	27615	28720	30098	30820	30958	30509	29577	29209
315	28990	26693	27280	28369	29734	30449	30584	30141	29219	28855
320	28638	26365	26949	28025	29377	30085	30217	29774	28868	28504
325	28294	26040	26621	27684	29026	29728	29852	29413	28517	28159
330	27953	25719	26299	27346	28681	29370	29491	29058	28173	27818
335	27618	25400	25981	27014	28339	29016	29137	28707	27831	27484
340	27283	25089	25666	26686	27995	28665	28789	28363	27497	27152
345	26955	24777	25358	26362	27661	28320	28442	28022	27165	26824
350	26631	24472	25049	26043	27329	27982	28097	27684	26837	26498
355	26309	24170	24744	25725	27001	27648	27759	27346	26516	26175
360	25994	23875	24442	25413	26680	27316	27425	27014	26194	25860
365	25679	23579	24144	25105	26362	26988	27093	26680	25876	25545
370	25367	23291	23852	24800	26043	26660	26765	26362	25564	25233
375	25062	23005	23560	24498	25728	26335	26444	26043	25253	24928
380	24757	22720	23271	24199	25420	26017	26125	25725	24944	24623
385	24459	22441	22989	23904	25115	25705	25804	25413	24642	24324
390	24160	22162	22707	23609	24810	25394	25489	25102	24341	24026
395	23865	21886	22428	23320	24511	25085	25177	24797	24042	23734
400	23573	21611	22152	23035	24213	24777	24869	24491	23743	23436
405	23287	21342	21877	22749	23921	24475	24564	24193	23455	23150
410	23002	21076	21604	22467	23629	24177	24262	23898	23166	22864
415	22717	20810	21335	22188	23340	23881	23963	23602	22881	22579
420	22438	20551	21070	21916	23056	23586	23668	23307	22595	22300
425	22159	20292	20807	21644	22772	23294	23376	23018	22313	22024
430	21886	20036	20548	21375	22490	23005	23087	22730	22034	21749
435	21614	19780	20289	21106	22211	22720	22799	22448	21759	21476
440	21345	19531	20033	20840	21936	22438	22513	22169	21486	21207
445	21076	19281	19780	20577	21663	22156	22231	21890	21217	20942
450	20814	19035	19528	20318	21394	21880	21949	21614	20948	20679
455	20551	18793	19278	20062	21129	21604	21670	21342	20679	20417
460	20289	18550	19032	19806	20863	21332	21398	21070	20417	20154
465	20033	18310	18788	19554	20600	21060	21122	20804	20154	19895
470	19777	18074	18543	19301	20338	20791	20853	20538	19895	19639
475	19524	17838	18301	19052	20082	20525	20584	20272	19639	19386
480	19272	17602	18064	18806	19826	20262	20318	20007	19383	19137
485	19022	17372	17828	18560	19573	20000	20052	19747	19131	18888
490	18774	17142	17595	18317	19321	19741	19790	19491	18881	18642
495	18530	16913	17362	18077	19068	19485	19531	19236	18629	18396
500	18287	16686	17133	17838	18819	19229	19272	18980	18383	18150
510	17808	16240	16673	17369	18333	18724	18763	18484	17894	17671
520	17336	15804	16229	16906	17851	18232	18261	17992	17415	17201
530	16870	15374	15781	16450	17375	17740	17769	17507	16939	16736
540	16414	14948	15344	16001	16909	17257	17287	17028	16473	16276
550	15961	14531	14915	15558	16450	16781	16808	16558	16017	15823
560	15518	14117	14491	15121	15994	16316	16339	16093	15566	15381
570	15079	13714	14075	14695	15548	15856	15873	15640	15118	14941
580	14646	13314	13665	14272	15108	15404	15417	15187	14682	14508
590	14222	12920	13258	13855	14672	14954	14967	14747	14245	14081
600	13799	12530	12858	13445	14245	14511	14524	14308	13819	13661
610	13386	12146	12466	13038	13822	14075	14088	13878	13399	13248
620	12976	11768	12073	12634	13402	13642	13655	13451	12982	12835
630	12572	11398	11690	12244	12992	13219	13228	13031	12572	12431
640	12175	11030	11309	11854	12585	12799	12808	12618	12169	12051
650	11781	10666	10935	11467	12182	12385	12395	12208	11772	11637
660	11391	10308	10568	11086	11785	11975	11985	11804	11378	11250
670	11007	9954	10203	10712	11391	11572	11578	11404	10988	10863
680	10627	9606	9843	10341	11004	11171	11178	11010	10604	10486
690	10253	9262	9486	9977	10620	10778	10784	10620	10226	10108
700	9882	8921	9137	9613	10243	10384	10394	10233	9849	9738
710	9518	8583	8793	9255	9869	10000	10007	9852	9482	9370
720	9159	8248	8451	8904	9498	9616	9626	9478	9117	9009
730	8796	7920	8114	8556	9134	9239	9249	9108	8753	8648
740	8442	7595	7779	8212	8773	8865	8878	8740	8396	8294
750	8091	7274	7451	7871	8415	8494	8507	8376	8045	7943
760	7746	6955	7126	7536	8061	8130	8143	8015	7694	7598
770	7402	6640	6804	7201	7710	7769	7782	7661	7346	7254
780	7064	6329	6490	6873	7362	7415	7428	7308	7005	6916
790	6726	6020	6175	6549	7018	7060	7073	6959	6667	6581
800	6394	5719	5863	6227	6680	6709	6726	6614	6332	6250
810	6066	5417	5558	5912	6342	6365	6378	6270	6001	5922
820	5738	5116	5256	5597	6010	6024	6037	5932	5673	5600
830	5417	4823	4957	5289	5682	5682	5702	5597	5348	5282
840	5098	4531	4659	4984	5354	5348	5364	5269	5026	4964
850	4780	4245	4367	4678	5033	5016	5033	4941	4708	4652
860	4469	3960	4075	4377	4715	4688	4705	4616	4393	4344
870	4157	3676	3786	4081	4400	4364	4380	4295	4081	4035
880	3848	3402	3504	3786	4088	4039	4055	3976	3773	3734
890	3547	3127	3222	3491	3700	3720	3737	3661	3465	3435
900	3241	2858	2943	3202	3474	3402	3419	3350	3163	3140
910	2943	2592	2671	2917	3173	3091	3104	3038	2861	2846
920	2648	2326	2398	2635	2871	2779	2792	2733	2566	2556
930	2352	2067	2129	2356	2575	2470	2484	2431	2270	2267
940	2060	1808	1864	2077	2280	2162	2178	2129	1975	1985
950	1772	1555	1601	1804	1988	1860	1873	1831	1686	1703
960	1486	1302	1342	1532	1699	1558	1575	1535	1401	1424
970	1201	1053	1086	1260	1414	1260	1276	1243	1115	1145
980	922	807	830	994	1132	968	978	951	833	873
990	640	561	581	728	853	673	686	666	594	600

*Pressure altitude is defined as the indicated altitude of pressure altimeter when the altimeter is set at 1013.25 mb and calibrated with the Standard Atmosphere.

TABLE 5.4.—*Continued*

GEOPOTENTIAL ALTITUDE IN FEET AS A FUNCTION OF PRESSURE IN MILLIBARS

P, mb	Pressure altitude*	75° N. Jan	60° N. Jan	45° N. Jan	30° N. Jan	15° N. Annual	30° N. July	45° N. July	60° N. July	75° N. July
1000	364	322	331	446	576	381	390	381	276	331
1010	89	82	85	207	299	92	102	98		86

*Pressure altitude is defined as the indicated altitude of pressure altimeter when the altimeter is set at 1013.25 mb and calibrated with the Standard Atmosphere.

PART 6

Tables of Properties of Supplementary Atmospheres above 120 Kilometers

Part 6.1

120 km to 1000 km

Winter Models

TEMPERATURE, PRESSURE, DENSITY, SCALE HEIGHT, MOLECULAR WEIGHT, AND NUMBER DENSITIES

Metric Units

WINTER MODEL, EXOSPHERIC TEMPERATURE = 600° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
120	333.5	17.055	16.984	17.763	13.567		27.12	10.82	3.631 - 5	-4.440	3.551 - 8	-7.4496
125	361.6	16.793	16.836	17.529	13.517		26.78	11.90	2.338	-4.631	2.083	-7.6813
130	386.8	16.553	16.701	17.315	13.473		26.43	12.92	1.563	-4.806	1.285	-7.8912
135	408.9	16.331	16.578	17.118	13.433		26.07	13.87	1.076	-4.968	8.251 - 9	-8.0835
140	428.9	16.123	16.464	16.933	13.397		25.69	14.78	7.589 - 6	-5.120	5.468	-8.2622
145	446.6	15.926	16.357	16.759	13.363		25.30	15.65	5.464	-5.263	3.723	-8.4291
150	462.8	15.739	16.255	16.593	13.332		24.90	16.51	4.003	-5.398	2.591	-8.5865
155	477.4	15.559	16.159	16.434	13.303		24.49	17.34	2.979 - 6	-5.526	1.838 - 9	-8.7356
160	490.7	15.386	16.066	16.281	13.276		24.08	18.16	2.248	-5.648	1.327	-8.8773
165	502.5	15.219	15.977	16.133	13.250		23.65	18.96	1.717	-5.765	9.721 -10	-9.0123
170	513.3	15.056	15.891	15.990	13.225		23.23	19.75	1.326	-5.877	7.218	-9.1416
175	523.2	14.898	15.808	15.850	13.201		22.81	20.53	1.035	-5.985	5.425	-9.2656
180	532.1	14.744	15.727	15.714	13.178		22.39	21.30	8.146 - 7	-6.089	4.123	-9.3848
185	540.1	14.593	15.649	15.581	13.156		21.98	22.06	6.468	-6.189	3.166	-9.4995
190	547.6	14.445	15.572	15.451	13.134		21.58	22.82	5.177	-6.286	2.453	-9.6103
195	554.5	14.299	15.496	15.323	13.113		21.18	23.58	4.173	-6.380	1.917	-9.7173
200	561.0	14.156	15.422	15.197	13.093		20.80	24.32	3.387	-6.470	1.510	-9.8209
205	567.3	14.015	15.349	15.072	13.073		20.44	25.08	2.766 - 7	-6.558	1.199 -10	-9.9214
210	573.3	13.875	15.277	14.950	13.053		20.09	25.82	2.273	-6.643	9.577 -11	-10.0188
215	579.3	13.738	15.206	14.829	13.034		19.75	26.58	1.878	-6.726	7.700	-10.1135
220	585.3	13.602	15.136	14.709	13.015		19.43	27.33	1.560	-6.807	6.231	-10.2054
225	587.2	13.470	15.069	14.594	12.997		19.13	27.89	1.302	-6.885	5.102	-10.2923
230	588.9	13.339	15.003	14.479	12.980		18.85	28.44	1.090	-6.963	4.196	-10.3771
235	590.3	13.208	14.937	14.364	12.963		18.58	28.97	9.158 - 8	-7.038	3.466	-10.4602
240	591.6	13.079	14.872	14.251	12.947		18.32	29.48	7.718	-7.112	2.875	-10.5414
245	592.7	12.949	14.807	14.137	12.930		18.08	29.98	6.524	-7.186	2.393	-10.6210
250	593.7	12.821	14.742	14.025	12.914		17.85	30.46	5.529	-7.257	1.999	-10.6991
255	594.5	12.692	14.677	13.912	12.897		17.63	30.92	4.698 - 8	-7.328	1.676 -11	-10.7758
260	595.2	12.565	14.613	13.800	12.881		17.43	31.37	4.001	-7.398	1.409	-10.8511
265	595.8	12.437	14.549	13.689	12.865		17.23	31.81	3.416	-7.467	1.188	-10.9251
270	596.4	12.310	14.486	13.578	12.849		17.05	32.23	2.922	-7.534	1.005	-10.9980
275	596.9	12.184	14.422	13.467	12.833		16.87	32.65	2.504	-7.601	8.514 -12	-11.0698
280	597.3	12.057	14.359	13.356	12.817		16.70	33.05	2.151	-7.667	7.233	-11.1407
285	597.6	11.931	14.296	13.246	12.801		16.54	33.45	1.851	-7.733	6.158	-11.2105
290	597.9	11.805	14.233	13.136	12.785		16.37	33.85	1.595	-7.797	5.254	-11.2795
295	598.2	11.680	14.170	13.026	12.769		16.22	34.25	1.377	-7.861	4.490	-11.3477
300	598.4	11.555	14.107	12.916	12.754		16.06	34.65	1.191	-7.924	3.844	-11.4152
310	598.8	11.305	13.982	12.696	12.722		15.74	35.47	8.955 - 9	-8.048	2.831 -12	-11.5480
320	599.1	11.057	13.858	12.480	12.691		15.41	36.35	6.778	-8.169	2.098	-11.6783
330	599.3	10.809	13.734	12.263	12.660		15.06	37.33	5.167	-8.287	1.562	-11.8064
340	599.5	10.562	13.611	12.047	12.629		14.68	38.43	3.967	-8.401	1.168	-11.9324
350	599.6	10.316	13.487	11.831	12.598		14.25	39.70	3.071	-8.513	8.780 -13	-12.0565
360	599.7	10.071	13.365	11.617	12.568		13.78	41.21	2.398	-8.620	6.625	-12.1788
370	599.8	9.826	13.243	11.403	12.537		13.24	43.00	1.891	-8.723	5.021	-12.2992
380	599.8	9.583	13.121	11.189	12.506		12.65	45.16	1.507	-8.822	3.821	-12.4178
390	599.9	9.340	12.999	10.977	12.476		12.00	47.75	1.215	-8.916	2.922	-12.5343
400	599.9	9.097	12.878	10.765	12.446		11.30	50.87	9.914 -10	-9.004	2.245	-12.6487

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
410	599.9	8.856	12.757	10.553	12.416		10.55	54.61	8.199 -10	-9.086	1.735 -13	-12.7607
420	599.9	8.615	12.637	10.342	12.385		9.78	59.08	6.875	-9.163	1.349	-12.8701
430	600.0	8.375	12.517	10.132	12.355		9.01	64.38	5.845	-9.233	1.055	-12.9766
440	600.0	8.136	12.397	9.923	12.325		8.24	70.59	5.038	-9.298	8.320 -14	-13.0799
450	600.0	7.897	12.278	9.714	12.296		7.50	77.81	4.402	-9.356	6.615	-13.1795
460	600.0	7.659	12.159	9.505	12.266		6.80	86.06	3.895	-9.409	5.307	-13.2751
470	600.0	7.422	12.040	9.298	12.236		6.15	95.37	3.488	-9.457	4.301	-13.3664
480	600.0	7.185	11.922	9.091	12.207		5.57	105.69	3.157	-9.501	3.524	-13.4530
490	600.0	6.950	11.804	8.884	12.177		5.05	116.92	2.886	-9.540	2.920	-13.5347
500	600.0	6.714	11.687	8.678	12.148	12.121	4.59	128.93	2.660	-9.575	2.448	-13.6113
510	600.0	6.480	11.569	8.473	12.118	12.113	4.19	141.53	2.470 -10	-9.607	2.077 -14	-13.6826
520	600.0	6.246	11.452	8.268	12.089	12.106	3.85	154.50	2.309	-9.637	1.783	-13.7488
530	600.0	6.013	11.336	8.064	12.060	12.098	3.56	167.62	2.170	-9.664	1.549	-13.8099
540	600.0	5.781	11.220	7.861	12.031	12.091	3.31	180.68	2.048	-9.689	1.361	-13.8662
550	600.0	5.549	11.104	7.658	12.002	12.084	3.10	193.49	1.942	-9.712	1.208	-13.9179
560	600.0	5.318	10.988	7.456	11.973	12.077	2.92	205.92	1.847	-9.734	1.083	-13.9654
570	600.0	5.087	10.873	7.254	11.944	12.069	2.77	217.86	1.762	-9.754	9.791 -15	-14.0092
580	600.0	4.858	10.758	7.053	11.915	12.062	2.64	229.25	1.685	-9.773	8.923	-14.0495
590	600.0	4.629	10.644	6.852	11.887	12.055	2.53	240.07	1.614	-9.792	8.189	-14.0868
600	600.0	4.400	10.529	6.652	11.858	12.048	2.43	250.33	1.550	-9.810	7.561	-14.1214
610	600.0	4.172	10.416	6.453	11.830	12.040	2.35	260.06	1.490 -10	-9.827	7.019 -15	-14.1537
620	600.0	3.945	10.302	6.254	11.801	12.033	2.28	269.31	1.435	-9.843	6.546	-14.1841
630	600.0	3.719	10.189	6.056	11.773	12.026	2.21	278.12	1.384	-9.859	6.128	-14.2127
640	600.0	3.493	10.076	5.858	11.745	12.019	2.15	286.56	1.335	-9.874	5.757	-14.2398
650	600.0	3.268	9.963	5.661	11.717	12.012	2.10	294.67	1.290	-9.889	5.425	-14.2656
660	600.0	3.043	9.851	5.465	11.688	12.005	2.05	302.52	1.248	-9.904	5.125	-14.2903
670	600.0	2.819	9.739	5.268	11.660	11.998	2.00	310.14	1.208	-9.918	4.852	-14.3141
680	600.0	2.596	9.627	5.073	11.633	11.991	1.96	317.57	1.170	-9.932	4.603	-14.3370
690	600.0	2.374	9.516	4.878	11.605	11.984	1.92	324.86	1.134	-9.945	4.374	-14.3591
700	600.0	2.152	9.405	4.684	11.577	11.977	1.89	332.04	1.100	-9.959	4.163	-14.3806
710	600.0	1.930	9.294	4.490	11.549	11.970	1.85	339.12	1.068 -10	-9.972	3.968 -15	-14.4015
720	600.0	1.709	9.184	4.297	11.522	11.963	1.82	346.14	1.037	-9.984	3.786	-14.4218
730	600.0	1.489	9.074	4.104	11.494	11.956	1.79	353.10	1.008	-9.997	3.617	-14.4416
740	600.0	1.270	8.964	3.912	11.467	11.949	1.76	360.03	9.799 -11	-10.009	3.459	-14.4610
750	600.0	1.051	8.855	3.720	11.439	11.942	1.73	366.92	9.533	-10.021	3.311	-14.4800
760	600.0	0.833	8.746	3.529	11.412	11.935	1.71	373.80	9.279	-10.033	3.173	-14.4986
770	600.0	0.615	8.637	3.339	11.385	11.928	1.68	380.65	9.036	-10.044	3.043	-14.5168
780	600.0	0.398	8.528	3.149	11.358	11.922	1.65	387.50	8.804	-10.055	2.920	-14.5346
790	600.0	0.182	8.420	2.959	11.331	11.915	1.63	394.33	8.581	-10.066	2.805	-14.5521
800	600.0	-0.034	8.312	2.770	11.304	11.908	1.61	401.15	8.368	-10.077	2.696	-14.5692
820	600.0	-0.464	8.097	2.394	11.250	11.894	1.56	414.77	7.968 -11	-10.099	2.497 -15	-14.6026
840	600.0	-0.892	7.884	2.020	11.196	11.881	1.52	428.32	7.599	-10.119	2.319	-14.6347
860	600.0	-1.319	7.672	1.647	11.143	11.868	1.49	441.80	7.250	-10.140	2.158	-14.6656
880	600.0	-1.739	7.460	1.277	11.090	11.854	1.45	455.15	6.941	-10.159	2.015	-14.6956
900	600.0	-2.160	7.249	0.909	11.038	11.841	1.42	468.37	6.647	-10.177	1.886	-14.7245
920	600.0	-2.578	7.040	0.543	10.985	11.828	1.38	481.42	6.372	-10.196	1.769	-14.7523
940	600.0	-2.994	6.832	0.179	10.933	11.815	1.36	494.27	6.116	-10.213	1.663	-14.7792
960	600.0	-3.407	6.626	-0.183	10.882	11.802	1.33	506.90	5.877	-10.231	1.566	-14.8051
980	600.0	-3.818	6.420	-0.543	10.830	11.789	1.30	519.27	5.652	-10.248	1.479	-14.8302
1000	600.0	-4.228	6.216	-0.901	10.779	11.776	1.28	531.38	5.441	-10.264	1.399	-14.8543

WINTER MODEL, EXOSPHERIC TEMPERATURE = 700° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
120	333.6	17.057	16.985	17.764	13.567		27.12	10.83	3.646 - 5	-4.438	3.565 - 8	-7.4480
125	373.9	16.784	16.824	17.570	13.509		26.79	12.30	2.365	-4.626	2.039	-7.6907
130	409.9	16.543	16.683	17.304	13.459		26.46	13.68	1.609	-4.793	1.250	-7.9032
135	440.9	16.327	16.559	17.110	13.416		26.13	14.92	1.135	-4.945	8.086 - 9	-8.0923
140	468.6	16.127	16.446	16.933	13.378		25.78	16.10	8.219 - 6	-5.085	5.437	-8.2646
145	493.3	15.942	16.343	16.768	13.344		25.44	17.20	6.087	-5.216	3.775	-8.4231
150	515.5	15.768	16.246	16.613	13.313		25.08	18.25	4.591	-5.338	2.687	-8.5707
155	535.5	15.603	16.155	16.466	13.284		24.73	19.27	3.517 - 6	-5.454	1.953 - 9	-8.7093
160	553.5	15.445	16.069	16.326	13.257		24.37	20.24	2.730	-5.564	1.446	-8.8399
165	569.5	15.294	15.988	16.192	13.232		24.01	21.17	2.145	-5.669	1.087	-8.9637
170	584.0	15.148	15.909	16.063	13.208		23.64	22.08	1.702	-5.769	8.286 -10	-9.0816
175	597.2	15.007	15.834	15.939	13.186		23.28	22.96	1.353	-5.866	6.390	-9.1945
180	609.1	14.870	15.761	15.817	13.165		22.92	23.83	1.101	-5.958	4.982	-9.3026
185	619.7	14.736	15.690	15.700	13.144		22.56	24.66	8.956 - 7	-6.048	3.922	-9.4065
190	629.5	14.606	15.622	15.584	13.124		22.21	25.49	7.337	-6.134	3.113	-9.5068
195	638.4	14.478	15.555	15.472	13.105		21.86	26.30	6.049	-6.218	2.491	-9.6036
200	646.7	14.352	15.489	15.361	13.087		21.52	27.10	5.016	-6.300	2.008	-9.6973
205	654.6	14.229	15.425	15.252	13.069		21.19	27.90	4.182 - 7	-6.379	1.628 -10	-9.7882
210	662.0	14.107	15.361	15.145	13.051		20.87	28.70	3.505	-6.455	1.329	-9.8765
215	669.2	13.987	15.299	15.039	13.034		20.56	29.49	2.951	-6.530	1.091	-9.9624
220	676.2	13.869	15.238	14.935	13.017		20.26	30.29	2.497	-6.603	8.998 -11	-10.0458
225	683.3	13.752	15.177	14.832	13.000		19.97	31.09	2.122	-6.673	7.459	-10.1273
230	685.5	13.639	15.120	14.733	12.985		19.70	31.68	1.809	-6.743	6.252	-10.2039
235	687.5	13.526	15.063	14.635	12.971		19.43	32.25	1.547	-6.810	5.260	-10.2790
240	689.2	13.415	15.006	14.537	12.956		19.18	32.81	1.327	-6.877	4.441	-10.3525
245	690.6	13.304	14.950	14.439	12.942		18.94	33.35	1.141	-6.943	3.762	-10.4246
250	691.9	13.193	14.895	14.342	12.927		18.70	33.88	9.831 - 8	-7.007	3.196	-10.4954
255	693.0	13.083	14.839	14.246	12.913		18.48	34.39	8.491 - 8	-7.071	2.724 -11	-10.5648
260	693.9	12.973	14.784	14.150	12.899		18.27	34.89	7.350	-7.134	2.328	-10.6331
265	694.7	12.864	14.729	14.054	12.885		18.07	35.37	6.375	-7.196	1.994	-10.7002
270	695.4	12.755	14.674	13.958	12.871		17.88	35.83	5.540	-7.257	1.713	-10.7662
275	696.1	12.646	14.620	13.863	12.858		17.70	36.29	4.822	-7.317	1.475	-10.8312
280	696.6	12.538	14.566	13.768	12.844		17.53	36.73	4.205	-7.376	1.273	-10.8953
285	697.0	12.429	14.511	13.674	12.830		17.36	37.15	3.673	-7.435	1.100	-10.9584
290	697.4	12.322	14.457	13.579	12.817		17.21	37.57	3.213	-7.493	9.534 -12	-11.0207
295	697.8	12.214	14.403	13.485	12.803		17.06	37.97	2.814	-7.551	8.276	-11.0822
300	698.1	12.107	14.350	13.391	12.790		16.92	38.37	2.469	-7.607	7.196	-11.1429
310	698.6	11.893	14.242	13.204	12.763		16.65	39.13	1.907 - 8	-7.720	5.467 -12	-11.2623
320	698.9	11.679	14.136	13.017	12.736		16.39	39.88	1.481	-7.829	4.177	-11.3791
330	699.2	11.467	14.029	12.831	12.709		16.15	40.62	1.155	-7.937	3.209	-11.4937
340	699.4	11.255	13.924	12.646	12.683		15.91	41.37	9.051 - 9	-8.043	2.476	-11.6063
350	699.5	11.045	13.818	12.461	12.656		15.67	42.14	7.123	-8.147	1.919	-11.7170
360	699.7	10.834	13.713	12.277	12.630		15.42	42.96	5.631	-8.249	1.492	-11.8261
370	699.7	10.625	13.608	12.093	12.604		15.15	43.84	4.472	-8.350	1.165	-11.9337
380	699.8	10.416	13.504	11.911	12.578		14.87	44.80	3.568	-8.448	9.122 -13	-12.0399
390	699.9	10.208	13.400	11.728	12.552		14.57	45.88	2.862	-8.543	7.166	-12.1447
400	699.9	10.000	13.296	11.546	12.526		14.24	47.09	2.308	-8.637	5.647	-12.2482

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_3)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
410	699.9	9.793	13.192	11.365	12.500		13.88	48.46	1.872 - 9	-8.728	4.463 -13	-12.3504
420	699.9	9.587	13.089	11.185	12.474		13.48	50.04	1.528	-8.816	3.538	-12.4512
430	700.0	9.381	12.986	11.004	12.448		13.05	51.85	1.255	-8.901	2.814	-12.5506
440	700.0	9.176	12.884	10.825	12.422		12.58	53.93	1.039	-8.983	2.246	-12.6486
450	700.0	8.971	12.781	10.646	12.397		12.08	56.33	8.665 -10	-9.062	1.799	-12.7451
460	700.0	8.767	12.679	10.467	12.371		11.55	59.08	7.285	-9.138	1.446	-12.8398
470	700.0	8.564	12.578	10.289	12.346		11.00	62.23	6.177	-9.209	1.167	-12.9328
480	700.0	8.361	12.476	10.112	12.321		10.43	65.83	5.283	-9.277	9.467 -14	-13.0238
490	700.0	8.159	12.375	9.935	12.295		9.85	69.90	4.559	-9.341	7.715	-13.1126
500	700.0	7.957	12.274	9.758	12.270	11.553	9.27	74.48	3.968	-9.401	6.322	-13.1992
510	700.0	7.756	12.174	9.582	12.245	11.547	8.70	79.59	3.485 -10	-9.458	5.210 -14	-13.2832
520	700.0	7.556	12.074	9.407	12.220	11.541	8.15	85.26	3.086	-9.511	4.321	-13.3644
530	700.0	7.356	11.974	9.232	12.195	11.534	7.62	91.43	2.756	-9.560	3.607	-13.4428
540	700.0	7.157	11.874	9.058	12.170	11.528	7.12	98.12	2.480	-9.606	3.033	-13.5181
550	700.0	6.958	11.775	8.884	12.145	11.522	6.65	105.28	2.247	-9.648	2.569	-13.5902
560	700.0	6.760	11.676	8.710	12.120	11.516	6.23	112.85	2.050	-9.688	2.193	-13.6589
570	700.0	6.563	11.577	8.538	12.096	11.509	5.84	120.73	1.882	-9.725	1.887	-13.7242
580	700.0	6.366	11.479	8.365	12.071	11.503	5.48	128.86	1.737	-9.760	1.637	-13.7860
590	700.0	6.170	11.380	8.193	12.046	11.497	5.17	137.12	1.611	-9.793	1.431	-13.8444
600	700.0	5.974	11.283	8.022	12.022	11.491	4.89	145.42	1.501	-9.824	1.260	-13.8995
610	700.0	5.779	11.185	7.851	11.997	11.485	4.64	153.67	1.404 -10	-9.853	1.119 -14	-13.9512
620	700.0	5.584	11.088	7.680	11.973	11.479	4.42	161.78	1.318	-9.880	1.000	-13.9998
630	700.0	5.390	10.991	7.511	11.949	11.472	4.23	169.68	1.240	-9.906	9.005 -15	-14.0455
640	700.0	5.196	10.894	7.341	11.925	11.466	4.06	177.31	1.171	-9.931	8.158	-14.0884
650	700.0	5.003	10.797	7.172	11.900	11.460	3.91	184.64	1.108	-9.955	7.434	-14.1288
660	700.0	4.811	10.701	7.004	11.876	11.454	3.77	191.64	1.051	-9.979	6.811	-14.1668
670	700.0	4.619	10.605	6.836	11.852	11.448	3.66	198.30	9.981 -11	-10.001	6.271	-14.2026
680	700.0	4.428	10.509	6.668	11.828	11.442	3.55	204.63	9.497	-10.022	5.799	-14.2366
690	700.0	4.237	10.414	6.501	11.805	11.436	3.46	210.65	9.051	-10.043	5.384	-14.2689
700	700.0	4.046	10.319	6.334	11.781	11.430	3.38	216.37	8.637	-10.064	5.016	-14.2996
710	700.0	3.857	10.224	6.168	11.757	11.424	3.31	221.81	8.251 -11	-10.083	4.688 -15	-14.3290
720	700.0	3.667	10.129	6.003	11.733	11.418	3.24	227.01	7.892	-10.103	4.393	-14.3572
730	700.0	3.479	10.035	5.838	11.710	11.412	3.18	232.00	7.555	-10.122	4.127	-14.3843
740	700.0	3.291	9.941	5.673	11.686	11.406	3.12	236.80	7.240	-10.140	3.886	-14.4105
750	700.0	3.103	9.847	5.509	11.663	11.400	3.07	241.45	6.943	-10.158	3.665	-14.4359
760	700.0	2.916	9.754	5.345	11.639	11.395	3.02	245.97	6.664	-10.176	3.463	-14.4606
770	700.0	2.729	9.660	5.181	11.616	11.389	2.98	250.39	6.401	-10.194	3.277	-14.4846
780	700.0	2.543	9.567	5.019	11.593	11.383	2.94	254.73	6.153	-10.211	3.104	-14.5080
790	700.0	2.358	9.475	4.856	11.570	11.377	2.90	259.01	5.918	-10.228	2.945	-14.5309
800	700.0	2.173	9.382	4.694	11.546	11.371	2.86	263.25	5.695	-10.244	2.796	-14.5534
820	700.0	1.804	9.198	4.372	11.500	11.360	2.78	271.69	5.285 -11	-10.277	2.528 -15	-14.5972
840	700.0	1.438	9.015	4.051	11.455	11.348	2.72	280.16	4.915	-10.308	2.293	-14.6398
860	700.0	0.711	8.651	3.415	11.364	11.325	2.59	297.51	4.279	-10.369	1.901	-14.7213
900	700.0	0.351	8.471	3.099	11.319	11.314	2.52	306.51	4.005	-10.397	1.736	-14.7603
920	700.0	-0.007	8.292	2.786	11.274	11.302	2.46	315.78	3.756	-10.425	1.589	-14.7988
940	700.0	-0.364	8.114	2.474	11.229	11.291	2.40	325.36	3.529	-10.452	1.457	-14.8365
960	700.0	-0.718	7.937	2.163	11.185	11.280	2.35	335.25	3.321	-10.479	1.338	-14.8734
980	700.0	-1.071	7.760	1.855	11.141	11.269	2.29	345.47	3.132	-10.504	1.231	-14.9096
1000	700.0	-1.421	7.585	1.548	11.097	11.258	2.23	356.03	2.958	-10.529	1.135	-14.9451

WINTER MODEL ATMOSPHERIC TEMPERATURE = 300° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
120	333.7	17.056	16.985	17.764	13.567		27.12	10.83	3.645 - 5	-4.438	3.563 - 8	-7.4482
125	386.0	16.774	16.812	17.509	13.501		26.80	12.70	2.382	-4.623	1.989	-7.7014
130	432.4	16.532	16.666	17.291	13.446		26.48	14.42	1.647	-4.783	1.213	-7.9161
135	472.2	16.320	16.541	17.101	13.401		26.17	15.95	1.185	-4.926	7.898 - 9	-8.1025
140	507.9	16.128	16.430	16.929	13.361		25.86	17.40	8.779 - 6	-5.057	5.375	-8.2696
145	539.2	15.952	16.329	16.772	13.326		25.54	18.77	6.656	-5.177	3.792	-8.4211
150	567.5	15.789	16.236	16.626	13.295		25.23	19.98	5.141	-5.289	2.749	-8.5609
155	592.5	15.635	16.150	16.489	13.266		24.91	21.16	4.031 - 6	-5.395	2.039 - 9	-8.6906
160	615.2	15.490	16.069	16.360	13.240		24.60	22.29	3.203	-5.495	1.540	-8.8125
165	635.4	15.351	15.992	16.236	13.216		24.28	23.36	2.572	-5.590	1.182	-8.9273
170	653.6	15.218	15.920	16.118	13.193		23.96	24.39	2.086	-5.681	9.197 -10	-9.0364
175	670.3	15.090	15.850	16.005	13.172		23.64	25.38	1.707	-5.768	7.240	-9.1402
180	685.2	14.966	15.784	15.895	13.151		23.33	26.33	1.406	-5.852	5.760	-9.2396
185	698.5	14.846	15.719	15.789	13.132		23.02	27.25	1.167	-5.933	4.625	-9.3349
190	710.6	14.728	15.657	15.685	13.114		22.71	28.14	9.745 - 7	-6.011	3.744	-9.4266
195	721.5	14.614	15.596	15.584	13.096		22.40	29.01	8.179	-6.087	3.054	-9.5151
200	731.7	14.502	15.537	15.485	13.079		22.10	29.87	6.901	-6.161	2.507	-9.6009
205	741.2	14.392	15.479	15.388	13.063		21.80	30.71	5.851 - 7	-6.233	2.070 -10	-9.6840
210	749.9	14.284	15.423	15.293	13.047		21.51	31.54	4.983	-6.303	1.719	-9.7647
215	758.2	14.177	15.367	15.199	13.031		21.22	32.37	4.261	-6.370	1.435	-9.8432
220	766.0	14.072	15.312	15.107	13.016		20.95	33.19	3.658	-6.437	1.203	-9.9197
225	774.0	13.968	15.258	15.015	13.000		20.68	34.02	3.153	-6.501	1.013	-9.9944
230	781.9	13.866	15.205	14.925	12.985		20.42	34.86	2.727	-6.564	8.564 -11	-10.0673
235	789.3	13.767	15.155	14.838	12.972		20.16	35.46	2.366	-6.626	7.314	-10.1359
240	796.5	13.669	15.105	14.752	12.959		19.92	36.05	2.057	-6.687	6.265	-10.2031
245	798.3	13.571	15.056	14.667	12.947		19.68	36.63	1.792	-6.747	5.382	-10.2690
250	789.9	13.474	15.007	14.581	12.934		19.45	37.19	1.565	-6.805	4.636	-10.3338
255	791.2	13.377	14.958	14.497	12.922		19.23	37.74	1.370 - 7	-6.863	4.004 -11	-10.3975
260	792.4	13.281	14.910	14.412	12.909		19.02	38.28	1.201	-6.920	3.466	-10.4601
265	793.5	13.185	14.861	14.328	12.897		18.81	38.81	1.055	-6.977	3.008	-10.5217
270	794.3	13.090	14.813	14.245	12.885		18.61	39.32	9.282 - 8	-7.032	2.616	-10.5824
275	795.1	12.995	14.766	14.161	12.873		18.42	39.82	8.180	-7.087	2.280	-10.6421
280	795.8	12.900	14.718	14.078	12.861		18.24	40.31	7.220	-7.141	1.991	-10.7009
285	796.3	12.805	14.670	13.995	12.849		18.07	40.79	6.383	-7.195	1.742	-10.7589
290	796.8	12.710	14.623	13.912	12.837		17.91	41.25	5.650	-7.248	1.527	-10.8161
295	797.3	12.616	14.576	13.830	12.825		17.75	41.70	5.009	-7.300	1.341	-10.8726
300	797.6	12.522	14.529	13.748	12.813		17.60	42.15	4.446	-7.352	1.180	-10.9283
310	798.2	12.335	14.435	13.584	12.789		17.31	43.00	3.515 - 8	-7.454	9.169 -12	-11.0377
320	798.7	12.148	14.341	13.420	12.766		17.05	43.81	2.792	-7.554	7.168	-11.1446
330	799.0	11.962	14.248	13.257	12.743		16.81	44.60	2.226	-7.652	5.633	-11.2492
340	799.3	11.777	14.156	13.095	12.719		16.58	45.36	1.783	-7.749	4.448	-11.3518
350	799.4	11.593	14.063	12.934	12.696		16.37	46.10	1.432	-7.844	3.527	-11.4526
360	799.6	11.409	13.971	12.773	12.673		16.16	46.85	1.155	-7.937	2.807	-11.5517
370	799.7	11.225	13.880	12.612	12.650		15.95	47.59	9.347 - 9	-8.029	2.243	-11.6493
380	799.8	11.042	13.788	12.452	12.627		15.75	48.36	7.588	-8.120	1.797	-11.7454
390	799.8	10.860	13.697	12.292	12.604		15.54	49.16	6.181	-8.209	1.444	-11.8403
400	799.9	10.679	13.606	12.133	12.582		15.32	50.00	5.052	-8.297	1.164	-11.9343

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
410	799.9	10.497	13.516	11.375	12.559		15.10	50.89	4.143 - 9	-8.383	9.407 -13	-12.0265
420	799.9	10.317	13.425	11.817	12.536		14.86	51.87	3.410	-8.467	7.620	-12.1180
430	799.9	10.137	13.335	11.659	12.514		14.61	52.93	2.818	-8.550	6.188	-12.2084
440	800.0	9.957	13.246	11.502	12.491		14.33	54.10	2.337	-8.631	5.037	-12.2979
450	800.0	9.778	13.156	11.345	12.469		14.04	55.40	1.947	-8.711	4.109	-12.3862
460	800.0	9.600	13.067	11.189	12.447		13.72	56.85	1.629	-8.788	3.361	-12.4736
470	800.0	9.422	12.979	11.033	12.425		13.38	58.47	1.370	-8.863	2.755	-12.5599
480	800.0	9.245	12.889	10.878	12.402		13.01	60.29	1.157	-8.937	2.264	-12.6451
490	800.0	9.068	12.801	10.723	12.380		12.62	62.33	9.832 -10	-9.007	1.866	-12.7291
500	800.0	8.891	12.713	10.569	12.358	11.102	12.21	64.62	8.398	-9.076	1.542	-12.8120
510	800.0	8.715	12.625	10.415	12.336	11.096	11.78	67.19	7.215 -10	-9.142	1.278 -13	-12.8935
520	800.0	8.540	12.537	10.261	12.314	11.091	11.33	70.05	6.236	-9.205	1.062	-12.9737
530	800.0	8.365	12.450	10.108	12.292	11.085	10.87	73.23	5.423	-9.266	8.864 -14	-13.0524
540	800.0	8.191	12.362	9.956	12.271	11.080	10.40	76.76	4.746	-9.324	7.421	-13.1295
550	800.0	8.017	12.276	9.803	12.249	11.074	9.93	80.65	4.179	-9.379	6.238	-13.2049
560	800.0	7.844	12.189	9.652	12.227	11.069	9.46	84.92	3.704	-9.431	5.266	-13.2786
570	800.0	7.671	12.102	9.500	12.206	11.063	8.99	89.56	3.302	-9.481	4.464	-13.3503
580	800.0	7.499	12.016	9.350	12.184	11.058	8.54	94.59	2.962	-9.528	3.803	-13.4199
590	800.0	7.327	11.930	9.199	12.162	11.053	8.10	99.98	2.673	-9.573	3.255	-13.4874
600	800.0	7.156	11.845	9.049	12.141	11.047	7.68	105.71	2.425	-9.615	2.801	-13.5526
610	800.0	6.985	11.759	8.900	12.120	11.042	7.29	111.76	2.212 -10	-9.655	2.424 -14	-13.6155
620	800.0	6.814	11.674	8.751	12.099	11.036	6.92	118.09	2.027	-9.693	2.109	-13.6760
630	800.0	6.645	11.589	8.602	12.077	11.031	6.57	124.64	1.867	-9.729	1.845	-13.7340
640	800.0	6.475	11.505	8.454	12.056	11.026	6.26	131.35	1.727	-9.763	1.624	-13.7894
650	800.0	6.306	11.420	8.306	12.035	11.020	5.96	138.17	1.603	-9.795	1.437	-13.8424
660	800.0	6.138	11.336	8.158	12.014	11.015	5.70	145.03	1.494	-9.826	1.280	-13.8929
670	800.0	5.970	11.252	8.011	11.993	11.010	5.46	151.87	1.396	-9.855	1.146	-13.9409
680	800.0	5.803	11.168	7.865	11.972	11.005	5.24	158.63	1.309	-9.883	1.031	-13.9866
690	800.0	5.636	11.085	7.719	11.951	10.999	5.04	165.25	1.231	-9.910	9.334 -15	-14.0299
700	800.0	5.469	11.001	7.573	11.930	10.994	4.87	171.69	1.160	-9.936	8.490	-14.0711
710	800.0	5.303	10.918	7.427	11.909	10.989	4.71	177.91	1.095 -10	-9.960	7.760 -15	-14.1102
720	800.0	5.138	10.836	7.283	11.889	10.984	4.57	183.88	1.037	-9.984	7.124	-14.1473
730	800.0	4.973	10.753	7.138	11.868	10.978	4.45	189.58	9.825 -11	-10.008	6.568	-14.1826
740	800.0	4.808	10.671	6.994	11.847	10.973	4.34	195.00	9.327	-10.030	6.079	-14.2162
750	800.0	4.644	10.589	6.850	11.827	10.968	4.24	200.13	8.867	-10.052	5.647	-14.2482
760	800.0	4.480	10.507	6.707	11.806	10.963	4.15	204.98	8.440	-10.074	5.262	-14.2788
770	800.0	4.317	10.425	6.564	11.786	10.958	4.07	209.56	8.042	-10.095	4.919	-14.3081
780	800.0	4.154	10.344	6.421	11.766	10.953	4.00	213.87	7.671	-10.115	4.610	-14.3363
790	800.0	3.992	10.263	6.279	11.745	10.948	3.93	217.94	7.324	-10.135	4.332	-14.3633
800	800.0	3.830	10.182	6.138	11.725	10.942	3.88	221.78	6.998	-10.155	4.079	-14.3895
820	800.0	3.507	10.021	5.855	11.685	10.932	3.78	228.85	6.404 -11	-10.194	3.637 -15	-14.4392
840	800.0	3.187	9.860	5.575	11.645	10.922	3.70	235.24	5.875	-10.231	3.264	-14.4862
860	800.0	2.551	9.542	5.018	11.565	10.902	3.56	246.58	4.977	-10.303	2.667	-14.5739
900	800.0	2.236	9.385	4.742	11.526	10.892	3.51	251.77	4.593	-10.338	2.424	-14.6154
920	800.0	1.922	9.229	4.466	11.486	10.882	3.46	256.78	4.246	-10.372	2.209	-14.6557
940	800.0	1.610	9.072	4.195	11.447	10.873	3.42	261.69	3.930	-10.406	2.018	-14.6951
960	800.0	1.300	8.917	3.923	11.409	10.863	3.37	266.57	3.644	-10.438	1.847	-14.7336
980	800.0	0.992	8.763	3.653	11.370	10.853	3.33	271.46	3.383	-10.471	1.693	-14.7714
1000	800.0	0.685	8.609	3.384	11.332	10.843	3.29	276.42	3.144	-10.502	1.554	-14.8086

WINTER MODEL, EXOSPHERIC TEMPERATURE = 900° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
120	333.9	17.055	16.984	17.763	13.567		27.12	10.84	3.640 - 5	-4.439	3.555 - 8	-7.4491
125	397.3	16.764	16.801	17.499	13.493		26.80	13.07	2.394	-4.621	1.942	-7.7117
130	453.5	16.521	16.651	17.279	13.434		26.50	15.11	1.678	-4.775	1.179	-7.9283
135	501.8	16.313	16.524	17.091	13.387		26.21	16.93	1.228	-4.911	7.715 - 9	-8.1127
140	545.0	16.127	16.413	16.924	13.346		25.92	18.62	9.271 - 6	-5.033	5.302	-8.2755
145	582.6	15.959	16.315	16.773	13.310		25.63	20.16	7.164	-5.145	3.790	-8.4213
150	616.6	15.804	16.225	16.634	13.279		25.34	21.61	5.639	-5.249	2.788	-8.5548
155	646.6	15.659	16.143	16.505	13.250		25.06	22.96	4.506 - 6	-5.346	2.100 - 9	-8.6777
160	673.9	15.523	16.066	16.384	13.224		24.78	24.24	3.645	-5.438	1.612	-8.7927
165	698.3	15.394	15.993	16.269	13.201		24.49	25.44	2.981	-5.526	1.257	-8.9005
170	720.5	15.271	15.925	16.159	13.179		24.21	26.60	2.459	-5.609	9.941 -10	-9.0026
175	740.3	15.153	15.860	16.055	13.158		23.93	27.69	2.046	-5.689	7.954	-9.0994
180	758.3	15.039	15.798	15.954	13.139		23.65	28.74	1. 14	-5.766	6.428	-9.1919
185	774.5	14.929	15.738	15.856	13.120		23.37	29.75	1.444	-5.840	5.243	-9.2804
190	789.2	14.822	15.680	15.761	13.103		23.10	30.72	1.224	-5.912	4.309	-9.3656
195	802.4	14.717	15.625	15.669	13.086		22.83	31.66	1.043	-5.982	3.568	-9.4476
200	814.5	14.616	15.571	15.579	13.070		22.55	32.57	8.925 - 7	-6.049	2.973	-9.5269
205	825.8	14.516	15.518	15.491	13.055		22.29	33.47	7.671 - 7	-6.115	2.490 -10	-9.6038
210	836.1	14.418	15.466	15.405	13.040		22.02	34.35	6.620	-6.179	2.097	-9.6784
215	845.8	14.322	15.415	15.320	13.025		21.76	35.22	5.733	-6.242	1.774	-9.7510
220	854.8	14.227	15.366	15.236	13.011		21.51	36.07	4.983	-6.303	1.508	-9.8216
225	863.6	14.133	15.317	15.154	12.997		21.26	36.92	4.345	-6.362	1.286	-9.8906
230	872.1	14.041	15.269	15.072	12.984		21.02	37.77	3.801	-6.420	1.102	-9.9580
235	880.2	13.950	15.221	14.992	12.970		20.78	38.62	3.335	-6.477	9.467 -11	-10.0238
240	882.9	13.862	15.176	14.915	12.959		20.55	39.23	2.933	-6.533	8.209	-10.0857
245	885.2	13.775	15.132	14.839	12.947		20.32	39.84	2.584	-6.588	7.135	-10.1466
250	887.2	13.689	15.089	14.763	12.936		20.10	40.43	2.282	-6.642	6.217	-10.2064
255	888.9	13.602	15.045	14.687	12.925		19.88	41.00	2.018 - 7	-6.695	5.429 -11	-10.2653
260	890.4	13.517	15.002	14.612	12.914		19.67	41.57	1.788	-6.748	4.751	-10.3232
265	891.7	13.431	14.959	14.537	12.903		19.47	42.13	1.586	-6.800	4.167	-10.3802
270	892.8	13.346	14.916	14.463	12.892		19.27	42.68	1.410	-6.851	3.661	-10.4364
275	893.8	13.261	14.873	14.388	12.881		19.08	43.22	1.255	-6.901	3.223	-10.4917
280	894.6	13.177	14.831	14.314	12.870		18.90	43.74	1.119	-6.951	2.843	-10.5463
285	895.3	13.092	14.788	14.240	12.859		18.72	44.26	9.986 - 8	-7.001	2.511	-10.6001
290	896.0	13.008	14.746	14.167	12.849		18.55	44.77	8.925	-7.049	2.223	-10.6531
295	896.5	12.924	14.704	14.093	12.838		18.39	45.27	7.987	-7.098	1.970	-10.7055
300	897.0	12.841	14.662	14.020	12.828		18.23	45.75	7.156	-7.145	1.749	-10.7572
310	897.7	12.674	14.579	13.874	12.806		17.93	46.70	5.764 - 8	-7.239	1.384 -11	-10.8587
320	898.3	12.508	14.496	13.729	12.786		17.65	47.60	4.662	-7.331	1.102	-10.9579
330	898.7	12.343	14.413	13.584	12.765		17.39	48.47	3.786	-7.422	8.813 -12	-11.0549
340	899.0	12.178	14.330	13.440	12.744		17.16	49.31	3.086	-7.511	7.082	-11.1498
350	899.3	12.014	14.248	13.296	12.724		16.93	50.12	2.524	-7.598	5.715	-11.2430
360	899.5	11.850	14.166	13.153	12.703		16.72	50.91	2.070	-7.684	4.630	-11.3344
370	899.6	11.687	14.085	13.010	12.683		16.52	51.68	1.704	-7.769	3.764	-11.4243
380	899.7	11.525	14.004	12.868	12.662		16.33	52.45	1.406	-7.852	3.070	-11.5128
390	899.8	11.363	13.923	12.726	12.642		16.15	53.21	1.164	-7.934	2.512	-11.6000
400	899.8	11.201	13.842	12.585	12.622		15.97	53.98	9.655 - 9	-8.015	2.061	-11.6860

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
410	899.9	11.040	13.761	12.444	12.602		15.79	54.76	8.033 - 9	-8.095	1.695 -12	-11.7708
420	899.9	10.880	13.681	12.303	12.582		15.60	55.57	6.701	-8.174	1.398	-11.8546
430	899.9	10.720	13.601	12.163	12.561		15.42	56.41	5.605	-8.251	1.155	-11.9375
440	899.9	10.560	13.521	12.023	12.542		15.22	57.30	4.701	-8.328	9.564 -13	-12.0194
450	900.0	10.401	13.442	11.884	12.522		15.02	58.24	3.953	-8.403	7.936	-12.1004
460	900.0	10.243	13.362	11.745	12.502		14.81	59.26	3.335	-8.477	6.599	-12.1805
470	900.0	10.084	13.283	11.607	12.482		14.58	60.35	2.821	-8.550	5.498	-12.2598
480	900.0	9.927	13.204	11.469	12.462		14.34	61.54	2.394	-8.621	4.589	-12.3383
490	900.0	9.769	13.126	11.331	12.443		14.09	62.84	2.038	-8.691	3.837	-12.4160
500	900.0	9.613	13.047	11.194	12.423	10.734	13.81	64.27	1.742	-8.759	3.215	-12.4928
510	900.0	9.456	12.969	11.057	12.403	10.729	13.52	65.84	1.493 - 9	-8.826	2.699 -13	-12.5688
520	900.0	9.301	12.891	10.921	12.384	10.725	13.22	67.57	1.285	-8.891	2.270	-12.6439
530	900.0	9.145	12.814	10.785	12.365	10.720	12.89	69.48	1.111	-8.954	1.914	-12.7182
540	900.0	8.990	12.736	10.649	12.345	10.715	12.55	71.58	9.640 -10	-9.016	1.616	-12.7915
550	900.0	8.836	12.659	10.514	12.326	10.710	12.19	73.90	8.401	-9.076	1.368	-12.8638
560	900.0	8.682	12.582	10.379	12.307	10.705	11.82	76.46	7.354	-9.133	1.161	-12.9351
570	900.0	8.528	12.505	10.244	12.287	10.700	11.43	79.26	6.468	-9.189	9.880 -14	-13.0052
580	900.0	8.375	12.429	10.110	12.268	10.695	11.04	82.33	5.715	-9.243	8.428	-13.0743
590	900.0	8.222	12.352	9.977	12.249	10.691	10.63	85.69	5.073	-9.295	7.210	-13.1421
600	900.0	8.070	12.276	9.843	12.230	10.686	10.23	89.34	4.525	-9.344	6.186	-13.2086
610	900.0	7.918	12.200	9.710	12.211	10.681	9.82	93.30	4.055 -10	-9.392	5.324 -14	-13.2738
620	900.0	7.767	12.124	9.578	12.192	10.676	9.42	97.56	3.652	-9.437	4.598	-13.3374
630	900.0	7.616	12.049	9.446	12.173	10.671	9.03	102.13	3.304	-9.481	3.985	-13.3996
640	900.0	7.465	11.974	9.314	12.154	10.667	8.64	107.01	3.002	-9.523	3.466	-13.4602
650	900.0	7.315	11.899	9.182	12.136	10.662	8.26	112.19	2.740	-9.562	3.026	-13.5191
660	900.0	7.165	11.824	9.051	12.117	10.657	7.90	117.63	2.512	-9.600	2.653	-13.5763
670	900.0	7.016	11.749	8.921	12.098	10.653	7.56	123.33	2.312	-9.636	2.335	-13.6316
680	900.0	6.867	11.675	8.790	12.080	10.648	7.23	129.26	2.136	-9.670	2.065	-13.6852
690	900.0	6.719	11.601	8.660	12.061	10.643	6.93	135.37	1.980	-9.703	1.833	-13.7368
700	900.0	6.571	11.527	8.531	12.042	10.639	6.64	141.62	1.842	-9.735	1.635	-13.7866
710	900.0	6.423	11.453	8.402	12.024	10.634	6.37	147.98	1.719 -10	-9.765	1.464 -14	-13.8344
720	900.0	6.276	11.379	8.273	12.006	10.629	6.13	154.39	1.609	-9.793	1.317	-13.8803
730	900.0	6.129	11.306	8.144	11.987	10.625	5.90	160.82	1.510	-9.821	1.190	-13.9244
740	900.0	5.983	11.233	8.016	11.969	10.620	5.69	167.21	1.421	-9.847	1.080	-13.9666
750	900.0	5.837	11.160	7.889	11.951	10.615	5.50	173.52	1.340	-9.873	9.842 -15	-14.0069
760	900.0	5.692	11.087	7.761	11.933	10.611	5.32	179.71	1.266	-9.898	9.005	-14.0455
770	900.0	5.546	11.014	7.634	11.914	10.606	5.16	185.75	1.199	-9.921	8.272	-14.0824
780	900.0	5.402	10.942	7.507	11.896	10.602	5.02	191.60	1.137	-9.944	7.626	-14.1177
790	900.0	5.257	10.870	7.381	11.878	10.597	4.89	197.24	1.080	-9.967	7.057	-14.1514
800	900.0	5.114	10.798	7.255	11.860	10.593	4.77	202.66	1.027	-9.988	6.551	-14.1837
820	900.0	4.827	10.655	7.004	11.824	10.584	4.57	212.76	9.329 -11	-10.030	5.699 -15	-14.2442
840	900.0	4.542	10.512	6.755	11.789	10.575	4.41	221.86	8.509	-10.070	5.013	-14.2999
860	900.0	3.977	10.230	6.260	11.718	10.557	4.17	237.22	7.149	-10.146	3.983	-14.3998
900	900.0	3.697	10.089	6.015	11.683	10.548	4.08	243.65	6.579	-10.182	3.588	-14.4451
920	900.0	3.418	9.950	5.771	11.648	10.539	4.01	249.39	6.066	-10.217	3.250	-14.4881
940	900.0	3.141	9.811	5.528	11.613	10.530	3.95	254.55	5.603	-10.252	2.958	-14.5291
960	900.0	2.865	9.674	5.287	11.579	10.522	3.90	259.24	5.184	-10.285	2.701	-14.5684
980	900.0	2.591	9.536	5.047	11.545	10.513	3.86	263.55	4.802	-10.319	2.475	-14.6064
1000	900.0	2.318	9.400	4.808	11.511	10.505	3.82	267.56	4.454	-10.351	2.273	-14.6433

WINTER MODEL, EXOSPHERIC TEMPERATURE = 1000° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
120	334.1	17.056	16.984	17.763	13.567		27.12	10.84	3.645 - 5	-4.438	3.558 - 8	-7.4488
125	407.2	16.757	16.792	17.491	13.487		26.81	13.39	2.410	-4.618	1.908	-7.7193
130	472.0	16.513	16.638	17.270	13.425		26.52	15.72	1.709	-4.767	1.155	-7.9375
135	527.8	16.307	16.511	17.084	13.375		26.24	17.79	1.268	-4.897	7.580 - 9	-8.1203
140	577.9	16.126	16.401	16.920	13.333		25.96	19.71	9.711 - 6	-5.013	5.248	-9.2800
145	621.6	15.964	16.304	16.774	13.297		25.70	21.45	7.617	-5.118	3.787	-8.4217
150	661.2	15.815	16.216	16.640	13.265		25.44	23.09	6.085	-5.216	2.815	-8.5505
155	696.2	15.677	16.136	16.517	13.237		25.18	24.60	4.934 - 6	-5.307	2.146 - 9	-8.6684
160	728.1	15.548	16.062	16.402	13.211		24.92	26.04	4.050	-5.393	1.667	-8.7780
165	756.5	15.427	15.993	16.293	13.188		24.66	27.38	3.359	-5.474	1.317	-8.8805
170	782.3	15.311	15.927	16.190	13.166		24.41	28.65	2.810	-5.551	1.054	-8.9770
175	805.6	15.200	15.866	16.092	13.146		24.15	29.86	2.368	-5.626	8.540 -10	-9.0685
180	826.7	15.094	15.807	15.997	13.127		23.90	31.01	2.009	-5.697	6.988	-9.1557
185	845.7	14.992	15.751	15.906	13.109		23.65	32.11	1.715	-5.766	5.769	-9.2389
190	863.1	14.892	15.697	15.818	13.092		23.40	33.17	1.471	-5.832	4.799	-9.3189
195	878.8	14.796	15.645	15.733	13.076		23.16	34.18	1.268	-5.897	4.020	-9.3958
200	893.2	14.702	15.594	15.650	13.061		22.91	35.17	1.098	-5.959	3.388	-9.4701
205	906.4	14.610	15.545	15.568	13.047		22.67	36.13	9.544 - 7	-6.020	2.871 -10	-9.5420
210	918.5	14.520	15.497	15.489	13.032		22.43	37.05	8.325	-6.080	2.445	-9.6117
215	929.6	14.432	15.450	15.411	13.019		22.19	37.96	7.288	-6.138	2.092	-9.6795
220	939.8	14.345	15.405	15.335	13.006		21.96	38.84	6.396	-6.194	1.797	-9.7453
225	949.7	14.259	15.359	15.259	12.993		21.73	39.73	5.632	-6.249	1.550	-9.8098
230	959.2	14.175	15.315	15.185	12.980		21.50	40.61	4.973	-6.303	1.341	-9.8727
235	968.6	14.092	15.271	15.111	12.967		21.28	41.50	4.403	-6.356	1.163	-9.9343
240	977.9	14.009	15.228	15.039	12.955		21.06	42.39	3.908	-6.408	1.013	-9.9946
245	980.9	13.931	15.188	14.969	12.945		20.85	43.02	3.477	-6.459	8.889 -11	-10.0512
250	983.3	13.852	15.148	14.901	12.934		20.64	43.63	3.098	-6.509	7.820	-10.1068
255	985.5	13.774	15.109	14.832	12.924		20.43	44.23	2.764 - 7	-6.558	6.895 -11	-10.1615
260	987.4	13.697	15.070	14.764	12.914		20.23	44.83	2.471	-6.607	6.090	-10.2154
265	989.0	13.619	15.031	14.696	12.904		20.04	45.41	2.212	-6.655	5.389	-10.2685
270	990.5	13.542	14.992	14.629	12.894		19.85	45.98	1.982	-6.703	4.778	-10.3208
275	991.7	13.466	14.953	14.562	12.884		19.66	46.55	1.779	-6.750	4.242	-10.3724
280	992.8	13.390	14.915	14.495	12.874		19.48	47.11	1.599	-6.796	3.773	-10.4233
285	993.8	13.313	14.877	14.428	12.865		19.30	47.65	1.439	-6.842	3.362	-10.4735
290	994.6	13.238	14.839	14.362	12.855		19.13	48.19	1.298	-6.887	2.999	-10.5230
295	995.3	13.162	14.801	14.296	12.845		18.96	48.72	1.169	-6.932	2.680	-10.5719
300	995.9	13.087	14.763	14.230	12.836		18.80	49.25	1.056	-6.976	2.398	-10.6202
310	996.9	12.936	14.687	14.098	12.817		18.49	50.27	8.636 - 8	-7.064	1.927 -11	-10.7151
320	997.7	12.787	14.613	13.967	12.798		18.21	51.25	7.092	-7.149	1.557	-10.8078
330	998.2	12.638	14.538	13.837	12.779		17.94	52.21	5.846	-7.233	1.263	-10.8985
340	998.7	12.490	14.464	13.707	12.761		17.69	53.13	4.835	-7.316	1.030	-10.9872
350	999.0	12.342	14.390	13.578	12.742		17.45	54.02	4.012	-7.397	8.429 -12	-11.0742
360	999.2	12.195	14.316	13.449	12.724		17.23	54.88	3.339	-7.476	6.925	-11.1596
370	999.4	12.048	14.243	13.320	12.705		17.03	55.72	2.786	-7.555	5.710	-11.2434
380	999.6	11.902	14.169	13.192	12.687		16.83	56.54	2.332	-7.632	4.723	-11.3258
390	999.7	11.756	14.097	13.064	12.669		16.65	57.34	1.956	-7.709	3.918	-11.4069
400	999.8	11.610	14.024	12.937	12.650		16.47	58.14	1.645	-7.784	3.260	-11.4868

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
410	999.8	11.465	13.951	12.810	12.632		16.30	58.92	1.387 - 8	-7.858	2.719 -12	-11.5655
420	999.9	11.321	13.879	12.684	12.614		16.14	59.71	1.172	-7.931	2.274	-11.6432
430	999.9	11.177	13.807	12.558	12.596		15.97	60.50	9.920 - 9	-8.003	1.906	-11.7199
440	999.9	11.033	13.735	12.432	12.578		15.81	61.31	8.418	-8.075	1.601	-11.7957
450	999.9	10.890	13.664	12.307	12.560		15.64	62.13	7.159	-8.145	1.347	-11.8706
460	1000.0	10.747	13.592	12.182	12.542		15.48	62.99	6.101	-8.215	1.136	-11.9447
470	1000.0	10.605	13.521	12.057	12.525		15.31	63.89	5.211	-8.283	9.593 -13	-12.0180
480	1000.0	10.463	13.450	11.933	12.507		15.13	64.83	4.461	-8.351	8.117	-12.0906
490	1000.0	10.322	13.379	11.809	12.489		14.94	65.83	3.828	-8.417	6.879	-12.1624
500	1000.0	10.181	13.309	11.685	12.471	10.430	14.75	66.89	3.292	-8.482	5.840	-12.2336
510	1000.0	10.040	13.238	11.562	12.454	10.426	14.54	68.03	2.839 - 9	-8.547	4.965 -13	-12.3040
520	1000.0	9.900	13.168	11.439	12.436	10.421	14.33	69.25	2.454	-8.610	4.229	-12.3738
530	1000.0	9.760	13.098	11.317	12.419	10.417	14.10	70.58	2.127	-8.672	3.607	-12.4429
540	1000.0	9.620	13.029	11.195	12.401	10.412	13.86	72.01	1.848	-8.733	3.081	-12.5113
550	1000.0	9.481	12.959	11.073	12.384	10.408	13.60	73.57	1.611	-8.793	2.636	-12.5790
560	1000.0	9.343	12.890	10.952	12.367	10.404	13.34	75.27	1.408	-8.851	2.259	-12.6460
570	1000.0	9.204	12.821	10.831	12.349	10.399	13.05	77.11	1.235	-8.908	1.939	-12.7123
580	1000.0	9.066	12.752	10.710	12.332	10.395	12.76	79.13	1.087	-8.964	1.668	-12.7779
590	1000.0	8.929	12.683	10.590	12.315	10.391	12.45	81.32	9.594 -10	-9.018	1.437	-12.8426
600	1000.0	8.792	12.615	10.470	12.298	10.386	12.13	83.70	8.498	-9.071	1.240	-12.9066
610	1000.0	8.655	12.546	10.350	12.281	10.382	11.80	86.29	7.555 -10	-9.122	1.072 -13	-12.9697
620	1000.0	8.519	12.478	10.231	12.264	10.378	11.46	89.11	6.740	-9.171	9.292 -14	-13.0319
630	1000.0	8.383	12.410	10.112	12.247	10.373	11.11	92.15	6.036	-9.219	8.069	-13.0932
640	1000.0	8.248	12.342	9.993	12.230	10.369	10.76	95.45	5.425	-9.266	7.022	-13.1535
650	1000.0	8.113	12.275	9.875	12.213	10.365	10.41	98.99	4.895	-9.310	6.126	-13.2128
660	1000.0	7.978	12.208	9.757	12.196	10.361	10.05	102.80	4.433	-9.353	5.358	-13.2710
670	1000.0	7.844	12.140	9.639	12.179	10.356	9.69	106.87	4.029	-9.395	4.698	-13.3281
680	1000.0	7.710	12.073	9.522	12.162	10.352	9.34	111.21	3.676	-9.435	4.131	-13.3840
690	1000.0	7.576	12.007	9.405	12.146	10.348	9.00	115.82	3.366	-9.473	3.642	-13.4387
700	1000.0	7.443	11.940	9.289	12.129	10.344	8.66	120.69	3.093	-9.510	3.221	-13.4920
710	1000.0	7.310	11.874	9.172	12.112	10.340	8.33	125.81	2.852 -10	-9.545	2.857 -14	-13.5441
720	1000.0	7.178	11.807	9.056	12.096	10.335	8.01	131.16	2.638	-9.579	2.542	-13.5948
730	1000.0	7.045	11.741	8.941	12.079	10.331	7.71	136.73	2.449	-9.611	2.270	-13.6441
740	1000.0	6.914	11.675	8.826	12.063	10.327	7.42	142.50	2.279	-9.642	2.033	-13.6919
750	1000.0	6.782	11.610	8.711	12.046	10.323	7.14	148.43	2.128	-9.672	1.827	-13.7382
760	1000.0	6.652	11.544	8.596	12.030	10.319	6.88	154.51	1.992	-9.701	1.648	-13.7831
770	1000.0	6.521	11.479	8.482	12.014	10.315	6.63	160.69	1.869	-9.728	1.491	-13.8265
780	1000.0	6.391	11.414	8.368	11.997	10.311	6.40	166.94	1.759	-9.755	1.354	-13.8684
790	1000.0	6.261	11.349	8.254	11.981	10.307	6.19	173.23	1.658	-9.780	1.234	-13.9087
800	1000.0	6.131	11.294	8.141	11.965	10.302	5.99	179.51	1.567	-9.805	1.128	-13.9476
820	1000.0	5.873	11.155	7.915	11.933	10.294	5.63	191.95	1.407 -10	-9.852	9.526 -15	-14.0211
840	1000.0	5.617	11.027	7.690	11.901	10.286	5.33	203.99	1.272	-9.896	8.147	-14.0890
860	1000.0	5.108	10.773	7.245	11.837	10.270	4.86	226.11	1.056	-9.976	6.171	-14.2096
900	1000.0	4.856	10.647	7.024	11.805	10.262	4.68	235.95	9.683 -11	-10.014	5.454	-14.2613
920	1000.0	4.605	10.521	6.804	11.774	10.254	4.54	244.90	8.910	-10.050	4.862	-14.3132
940	1000.0	4.356	10.396	6.586	11.743	10.247	4.42	252.98	8.223	-10.085	4.367	-14.3598
960	1000.0	4.108	10.272	6.369	11.712	10.239	4.32	260.24	7.606	-10.119	3.949	-14.4036
980	1000.0	3.861	10.149	6.153	11.681	10.231	4.23	266.75	7.050	-10.152	3.590	-14.4449
1000	1000.0	3.615	10.026	5.938	11.650	10.223	4.17	272.59	6.546	-10.184	3.280	-14.4841

WINTER MODEL, EXOSPHERIC TEMPERATURE = 1100° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log n(O_2)	log n(O)	log n(N_2)	log n(He)	log n(H)						
120	333.4	17.056	16.985	17.764	13.568		27.12	10.82	3.640 - 5	-4.439	3.561 - 8	-7.4484
125	414.2	16.750	16.785	17.484	13.483		26.81	13.62	2.415	-4.617	1.880	-7.7259
130	486.3	16.506	16.628	17.261	13.418		26.52	16.19	1.726	-4.763	1.132	-7.9461
135	548.6	16.301	16.500	17.076	13.366		26.25	18.48	1.293	-4.888	7.444 - 9	-8.1282
140	604.8	16.123	16.389	16.914	13.323		26.00	20.60	1.001	-4.999	5.176	-8.2860
145	654.3	15.964	16.293	16.771	13.286		25.74	22.54	7.941 - 6	-5.100	3.758	-8.4250
150	699.2	15.820	16.206	16.641	13.254		25.50	24.36	6.416	-5.193	2.814	-8.5506
155	739.4	15.687	16.127	16.522	13.225		25.26	26.05	5.262 - 6	-5.279	2.162 - 9	-8.6652
160	776.0	15.563	16.055	16.411	13.199		25.02	27.64	4.367	-5.360	1.693	-8.7712
165	808.9	15.447	15.988	16.307	13.176		24.78	29.13	3.662	-5.436	1.349	-8.8699
170	839.0	15.336	15.925	16.208	13.154		24.55	30.55	3.097	-5.509	1.090	-8.9626
175	866.2	15.231	15.865	16.115	13.134		24.31	31.89	2.639	-5.579	8.909 -10	-9.0502
180	891.1	15.131	15.809	16.025	13.115		24.08	33.17	2.263	-5.645	7.356	-9.1334
185	913.5	15.034	15.755	15.939	13.098		23.85	34.38	1.952	-5.710	6.130	-9.2126
190	934.1	14.941	15.704	15.856	13.081		23.63	35.55	1.692	-5.772	5.146	-9.2885
195	952.8	14.850	15.654	15.776	13.066		23.40	36.67	1.473	-5.832	4.351	-9.3614
200	970.0	14.762	15.606	15.698	13.051		23.18	37.75	1.288	-5.890	3.701	-9.4317
205	985.8	14.677	15.560	15.622	13.037		22.96	38.79	1.130 - 6	-5.947	3.165 -10	-9.4996
210	1000.1	14.593	15.515	15.548	13.023		22.74	39.79	9.950 - 7	-6.002	2.721	-9.5653
215	1013.6	14.511	15.471	15.475	13.010		22.52	40.78	8.789	-6.056	2.349	-9.6292
220	1026.1	14.431	15.428	15.404	12.997		22.31	41.75	7.786	-6.109	2.036	-9.6913
225	1037.8	14.351	15.386	15.334	12.985		22.10	42.69	6.916	-6.160	1.771	-9.7518
230	1048.7	14.274	15.345	15.266	12.973		21.89	43.62	6.159	-6.210	1.546	-9.8108
235	1059.7	14.197	15.304	15.198	12.961		21.68	44.56	5.499	-6.260	1.353	-9.8686
240	1070.6	14.121	15.264	15.131	12.950		21.48	45.51	4.922	-6.308	1.188	-9.9253
245	1074.3	14.049	15.227	15.067	12.940		21.28	46.17	4.413	-6.355	1.051	-9.9782
250	1077.6	13.977	15.191	15.004	12.930		21.08	46.81	3.963	-6.402	9.327 -11	-10.0303
255	1080.4	13.905	15.154	14.942	12.921		20.89	47.43	3.564 - 7	-6.448	8.289 -11	-10.0815
260	1082.9	13.834	15.118	14.879	12.911		20.70	48.05	3.210	-6.494	7.380	-10.1319
265	1085.0	13.764	15.083	14.817	12.902		20.51	48.66	2.895	-6.538	6.582	-10.1816
270	1086.9	13.693	15.047	14.756	12.893		20.33	49.26	2.614	-6.583	5.880	-10.2306
275	1088.6	13.624	15.012	14.695	12.884		20.15	49.85	2.363	-6.627	5.260	-10.2790
280	1090.0	13.554	14.977	14.634	12.875		19.97	50.43	2.138	-6.670	4.713	-10.3267
285	1091.3	13.484	14.942	14.573	12.866		19.80	51.01	1.938	-6.713	4.229	-10.3738
290	1092.4	13.415	14.907	14.512	12.857		19.63	51.57	1.758	-6.755	3.800	-10.4202
295	1093.3	13.346	14.872	14.452	12.848		19.47	52.13	1.596	-6.797	3.419	-10.4661
300	1094.2	13.278	14.838	14.392	12.839		19.31	52.68	1.451	-6.838	3.080	-10.5115
310	1095.5	13.141	14.769	14.272	12.822		19.00	53.76	1.202 - 7	-6.920	2.508 -11	-10.6006
320	1096.6	13.005	14.701	14.152	12.805		18.71	54.82	1.000	-7.000	2.052	-10.6877
330	1097.4	12.869	14.633	14.034	12.788		18.44	55.84	8.348 - 8	-7.078	1.687	-10.7730
340	1098.0	12.734	14.565	13.916	12.771		18.18	56.84	6.990	-7.156	1.392	-10.8564
350	1098.5	12.600	14.498	13.798	12.754		17.94	57.80	5.871	-7.231	1.153	-10.9382
360	1098.8	12.466	14.431	13.680	12.737		17.71	58.74	4.945	-7.306	9.584 -12	-11.0184
370	1099.1	12.332	14.364	13.564	12.720		17.49	59.65	4.177	-7.379	7.995	-11.0972
380	1099.3	12.199	14.298	13.447	12.704		17.29	60.54	3.536	-7.451	6.690	-11.1746
390	1099.5	12.067	14.231	13.331	12.687		17.10	61.41	3.002	-7.523	5.614	-11.2507
400	1099.6	11.934	14.165	13.215	12.670		16.92	62.26	2.553	-7.593	4.725	-11.3256

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
410	1099.7	11.803	14.099	13.100	12.654		16.75	63.09	2.177 - 8	-7.662	3.987 -12	-11.3994
420	1099.8	11.671	14.033	12.985	12.637		16.58	63.91	1.860	-7.731	3.372	-11.4721
430	1099.8	11.540	13.968	12.870	12.621		16.42	64.72	1.592	-7.798	2.859	-11.5438
440	1099.9	11.410	13.903	12.756	12.605		16.27	65.53	1.365	-7.865	2.429	-11.6146
450	1099.9	11.280	13.838	12.642	12.588		16.12	66.35	1.173	-7.931	2.067	-11.6846
460	1099.9	11.150	13.773	12.528	12.572		15.97	67.17	1.010	-7.996	1.763	-11.7537
470	1099.9	11.020	13.708	12.415	12.556		15.82	68.00	8.710 - 9	-8.060	1.506	-11.8220
480	1100.0	10.891	13.643	12.302	12.540		15.67	68.85	7.526	-8.123	1.289	-11.8897
490	1100.0	10.763	13.579	12.189	12.524		15.52	69.73	6.514	-8.186	1.105	-11.9566
500	1100.0	10.634	13.515	12.077	12.508	10.175	15.36	70.64	5.649	-8.248	9.488 -13	-12.0228
510	1100.0	10.507	13.451	11.965	12.492	10.171	15.20	71.59	4.908 - 9	-8.309	8.158 -13	-12.0884
520	1100.0	10.379	13.387	11.854	12.476	10.167	15.03	72.59	4.273	-8.369	7.024	-12.1534
530	1100.0	10.252	13.324	11.742	12.460	10.163	14.86	73.64	3.726	-8.429	6.056	-12.2178
540	1100.0	10.125	13.260	11.631	12.444	10.159	14.68	74.76	3.256	-8.487	5.229	-12.2816
550	1100.0	9.999	13.197	11.521	12.428	10.155	14.50	75.95	2.852	-8.545	4.520	-12.3448
560	1100.0	9.873	13.134	11.410	12.412	10.151	14.30	77.21	2.503	-8.602	3.913	-12.4075
570	1100.0	9.747	13.071	11.300	12.397	10.147	14.09	78.57	2.201	-8.657	3.392	-12.4696
580	1100.0	9.622	13.009	11.191	12.381	10.143	13.88	80.03	1.940	-8.712	2.944	-12.5311
590	1100.0	9.497	12.946	11.081	12.365	10.139	13.65	81.60	1.714	-8.766	2.559	-12.5920
600	1100.0	9.372	12.884	10.972	12.350	10.135	13.41	83.29	1.519	-8.819	2.227	-12.6523
610	1100.0	9.248	12.822	10.863	12.334	10.131	13.16	85.11	1.348 - 9	-8.870	1.941 -13	-12.7121
620	1100.0	9.124	12.760	10.755	12.319	10.127	12.90	87.07	1.201	-8.921	1.694	-12.7712
630	1100.0	9.000	12.698	10.647	12.303	10.123	12.63	89.19	1.072	-8.970	1.480	-12.8297
640	1100.0	8.877	12.636	10.539	12.288	10.119	12.35	91.47	9.594 -10	-9.018	1.296	-12.8875
650	1100.0	8.754	12.575	10.431	12.272	10.115	12.06	93.94	8.613	-9.065	1.136	-12.9446
660	1100.0	8.632	12.514	10.324	12.257	10.111	11.77	96.58	7.754	-9.110	9.975 -14	-13.0011
670	1100.0	8.510	12.453	10.217	12.242	10.108	11.46	99.43	7.002	-9.155	8.774	-13.0568
680	1100.0	8.388	12.392	10.111	12.227	10.104	11.15	102.49	6.342	-9.198	7.732	-13.1117
690	1100.0	8.267	12.331	10.004	12.211	10.100	10.84	105.76	5.761	-9.240	6.825	-13.1659
700	1100.0	8.146	12.271	9.898	12.196	10.096	10.52	109.26	5.249	-9.280	6.037	-13.2192
710	1100.0	8.025	12.210	9.793	12.181	10.092	10.20	112.99	4.797 -10	-9.319	5.350 -14	-13.2716
720	1100.0	7.904	12.150	9.687	12.166	10.089	9.88	116.96	4.397	-9.357	4.752	-13.3232
730	1100.0	7.784	12.090	9.582	12.151	10.085	9.57	121.16	4.043	-9.393	4.229	-13.3737
740	1100.0	7.665	12.030	9.477	12.136	10.081	9.25	125.60	3.728	-9.429	3.773	-13.4234
750	1100.0	7.545	11.970	9.373	12.121	10.077	8.95	130.27	3.448	-9.462	3.373	-13.4720
760	1100.0	7.426	11.911	9.269	12.106	10.073	8.65	135.18	3.197	-9.495	3.023	-13.5195
770	1100.0	7.307	11.852	9.165	12.092	10.070	8.36	140.30	2.974	-9.527	2 717	-13.5660
780	1100.0	7.189	11.792	9.061	12.077	10.066	8.07	145.63	2.773	-9.557	2.447	-13.6114
790	1100.0	7.071	11.733	8.958	12.062	10.062	7.80	151.16	2.592	-9.586	2.210	-13.6556
800	1100.0	6.953	11.674	8.855	12.047	10.059	7.54	156.86	2.429	-9.615	2.001	-13.6987
820	1100.0	6.719	11.557	8.649	12.018	10.051	7.05	168.71	2.148 -10	-9.668	1.655 -14	-13.7813
840	1100.0	6.486	11.441	8.445	11.989	10.044	6.60	180.99	1.916	-9.718	1.383	-13.8591
860	1100.0	6.023	11.209	8.040	11.931	10.029	5.87	205.97	1.557	-9.808	9.993 -15	-14.0003
900	1100.0	5.794	11.095	7.840	11.902	10.022	5.57	218.22	1.417	-9.849	8.630	-14.0640
920	1100.0	5.566	10.981	7.640	11.874	10.015	5.31	230.07	1.296	-9.887	7.529	-14.1233
940	1100.0	5.339	10.867	7.441	11.845	10.008	5.09	241.34	1.191	-9.924	6.629	-14.1785
960	1100.0	5.113	10.755	7.244	11.817	10.001	4.90	251.93	1.098	-9.959	5.888	-14.2300
980	1100.0	4.889	10.642	7.047	11.789	9.994	4.75	261.76	1.016	-9.993	5.271	-14.2781
1000	1100.0	4.666	10.531	6.852	11.761	9.987	4.61	270.82	9.423 -11	-10.026	4.752	-14.3231

WINTER MODEL, EXOSPHERIC TEMPERATURE = 1300° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
120	333.2	17.056	16.985	17.764	13.568		27.12	10.81	3.637 - 5	-4.439	3.960 - 8	-7.4485
125	424.5	16.742	16.775	17.476	13.476		26.81	13.96	2.425	-4.615	1.842	-7.7346
130	506.7	16.496	16.614	17.251	13.407		26.54	16.86	1.752	-4.756	1.104	-7.9571
135	579.1	16.293	16.483	17.066	13.353		26.28	19.48	1.330	-4.876	7.262 - 9	-8.1389
140	645.0	16.118	16.372	16.907	13.308		26.04	21.93	1.045	-4.981	5.074	-8.2946
145	703.7	15.964	16.276	16.767	13.270		25.81	24.18	8.412 - 6	-5.075	3.711	-8.4305
150	757.8	15.824	16.191	16.641	13.237		25.58	26.31	6.900	-5.161	2.802	-8.5525
155	807.2	15.697	16.113	16.526	13.207		25.37	28.31	5.746 - 6	-5.241	2.172 - 9	-8.6632
160	852.5	15.579	16.043	16.420	13.181		25.15	30.20	4.843	-5.315	1.719	-8.7648
165	893.7	15.469	15.977	16.322	13.157		24.94	31.98	4.124	-5.385	1.384	-8.8588
170	931.7	15.366	15.917	16.229	13.135		24.73	33.67	3.541	-5.451	1.131	-8.9467
175	966.4	15.268	15.860	16.141	13.115		24.53	35.26	3.063	-5.514	9.351 -10	-9.0291
180	998.6	15.175	15.806	16.058	13.096		24.33	36.80	2.666	-5.574	7.813	-9.1072
185	1028.1	15.086	15.755	15.978	13.079		24.13	38.26	2.334	-5.632	6.588	-9.1813
190	1055.4	15.001	15.707	15.902	13.063		23.93	39.65	2.052	-5.688	5.598	-9.2520
195	1080.3	14.918	15.661	15.829	13.047		23.74	40.99	1.813	-5.742	4.792	-9.3195
200	1103.5	14.838	15.616	15.758	13.033		23.55	42.27	1.608	-5.794	4.127	-9.3844
205	1124.8	14.761	15.573	15.689	13.019		23.36	43.51	1.431 - 6	-5.844	3.574 -10	-9.4469
210	1144.4	14.686	15.532	15.622	13.006		23.17	44.70	1.278	-5.894	3.111	-9.5071
215	1162.8	14.612	15.492	15.557	12.993		22.98	45.85	1.144	-5.942	2.719	-9.5655
220	1179.8	14.541	15.453	15.493	12.981		22.79	46.97	1.027	-5.988	2.387	-9.6222
225	1195.8	14.470	15.415	15.431	12.970		22.61	48.07	9.246 - 7	-6.034	2.103	-9.6772
230	1210.6	14.401	15.378	15.370	12.958		22.43	49.13	8.342	-6.079	1.859	-9.7307
235	1225.1	14.334	15.341	15.310	12.947		22.25	50.20	7.544	-6.122	1.648	-9.7831
240	1239.0	14.267	15.305	15.251	12.936		22.07	51.25	6.836	-6.165	1.465	-9.8342
245	1252.1	14.201	15.270	15.193	12.926		21.90	52.28	6.207	-6.207	1.306	-9.8842
250	1257.5	14.139	15.238	15.138	12.917		21.73	53.00	5.644	-6.248	1.173	-9.9307
255	1262.3	14.077	15.206	15.084	12.909		21.56	53.71	5.139 - 7	-6.289	1.056 -10	-9.9765
260	1266.5	14.016	15.175	15.030	12.900		21.39	54.39	4.685	-6.329	9.517 -11	-10.0215
265	1270.3	13.955	15.144	14.977	12.892		21.22	55.07	4.276	-6.369	8.593	-10.0659
270	1273.6	13.895	15.113	14.924	12.884		21.06	55.73	3.907	-6.408	7.770	-10.1096
275	1276.6	13.834	15.083	14.871	12.876		20.89	56.38	3.574	-6.447	7.035	-10.1527
280	1279.2	13.775	15.052	14.818	12.868		20.73	57.02	3.272	-6.485	6.379	-10.1953
285	1281.5	13.715	15.022	14.766	12.860		20.58	57.65	2.999	-6.523	5.791	-10.2372
290	1283.6	13.656	14.992	14.714	12.852		20.42	58.27	2.751	-6.561	5.264	-10.2787
295	1285.5	13.597	14.962	14.663	12.845		20.27	58.88	2.526	-6.598	4.790	-10.3197
300	1287.1	13.538	14.933	14.611	12.837		20.12	59.49	2.321	-6.634	4.364	-10.3602
310	1289.8	13.422	14.874	14.509	12.822		19.82	60.69	1.965 - 7	-6.707	3.633 -11	-10.4397
320	1292.0	13.306	14.816	14.407	12.807		19.54	61.84	1.669	-6.777	3.037	-10.5176
330	1293.7	13.190	14.758	14.306	12.792		19.27	62.98	1.422	-6.847	2.548	-10.5938
340	1295.0	13.076	14.700	14.206	12.778		19.01	64.09	1.215	-6.915	2.146	-10.6684
350	1296.1	12.961	14.643	14.106	12.763		18.77	65.18	1.041	-6.983	1.813	-10.7417
360	1296.9	12.848	14.586	14.006	12.749		18.53	66.25	8.940 - 8	-7.049	1.536	-10.8135
370	1297.6	12.734	14.529	13.907	12.735		18.31	67.29	7.697	-7.114	1.306	-10.8840
380	1298.1	12.622	14.473	13.808	12.721		18.09	68.31	6.641	-7.178	1.113	-10.9533
390	1298.5	12.509	14.416	13.710	12.707		17.89	69.31	5.743	-7.241	9.518 -12	-11.0214
400	1298.8	12.397	14.360	13.612	12.692		17.70	70.29	4.977	-7.303	8.157	-11.0884

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_3)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
410	1299.1	12.286	14.304	13.514	12.678		17.52	71.24	4.321 - 8	-7.364	7.308 -12	-11.1544
420	1299.3	12.174	14.249	13.417	12.665		17.35	72.18	3.758	-7.425	6.035	-11.2193
430	1299.4	12.064	14.193	13.320	12.651		17.18	73.09	3.275	-7.485	5.208	-11.2833
440	1299.5	11.953	14.138	13.223	12.637		17.02	74.00	2.859	-7.544	4.504	-11.3464
450	1299.6	11.843	14.083	13.126	12.623		16.87	74.89	2.499	-7.602	3.902	-11.4087
460	1299.7	11.733	14.028	13.030	12.609		16.73	75.76	2.189	-7.660	3.387	-11.4701
470	1299.8	11.623	13.973	12.934	12.595		16.59	76.63	1.919	-7.717	2.946	-11.5308
480	1299.8	11.514	13.919	12.839	12.582		16.45	77.50	1.686	-7.773	2.566	-11.5908
490	1299.9	11.405	13.864	12.743	12.568		16.32	78.36	1.483	-7.829	2.239	-11.6500
500	1299.9	11.297	13.810	12.648	12.555	9.772	16.19	79.22	1.306	-7.884	1.956	-11.7087
510	1299.9	11.189	13.756	12.554	12.541	9.769	16.06	80.09	1.152 - 8	-7.939	1.711 -12	-11.7666
520	1299.9	11.081	13.702	12.459	12.528	9.766	15.93	80.97	1.017	-7.992	1.500	-11.8241
530	1299.9	10.973	13.648	12.365	12.514	9.762	15.80	81.86	8.999 - 9	-8.046	1.316	-11.8809
540	1300.0	10.866	13.594	12.271	12.501	9.759	15.67	82.77	7.969	-8.099	1.156	-11.9372
550	1300.0	10.759	13.541	12.177	12.487	9.755	15.54	83.71	7.067	-8.151	1.016	-11.9930
560	1300.0	10.652	13.488	12.084	12.474	9.752	15.41	84.66	6.275	-8.202	8.949 -13	-12.0482
570	1300.0	10.546	13.434	11.991	12.461	9.749	15.28	85.65	5.580	-8.253	7.888	-12.1030
580	1300.0	10.440	13.381	11.898	12.447	9.745	15.14	86.68	4.969	-8.304	6.961	-12.1574
590	1300.0	10.334	13.328	11.806	12.434	9.742	15.00	87.75	4.430	-8.354	6.149	-12.2112
600	1300.0	10.229	13.276	11.713	12.421	9.739	14.85	88.86	3.956	-8.403	5.437	-12.2646
610	1300.0	10.124	13.223	11.621	12.408	9.735	14.70	90.03	3.538 - 9	-8.451	4.813 -13	-12.3176
620	1300.0	10.019	13.171	11.529	12.395	9.732	14.55	91.26	3.168	-8.499	4.264	-12.3702
630	1300.0	9.914	13.119	11.438	12.382	9.729	14.39	92.55	2.841	-8.546	3.782	-12.4223
640	1300.0	9.810	13.066	11.347	12.369	9.725	14.22	93.92	2.552	-8.593	3.357	-12.4740
650	1300.0	9.706	13.014	11.256	12.356	9.722	14.04	95.36	2.296	-8.639	2.984	-12.5253
660	1300.0	9.602	12.963	11.165	12.343	9.719	13.86	96.89	2.070	-8.684	2.654	-12.5761
670	1300.0	9.499	12.911	11.075	12.330	9.716	13.67	98.51	1.868	-8.729	2.363	-12.6265
680	1300.0	9.396	12.859	10.984	12.317	9.712	13.48	100.23	1.689	-8.772	2.106	-12.6765
690	1300.0	9.293	12.808	10.894	12.304	9.709	13.27	102.06	1.530	-8.815	1.879	-12.7261
700	1300.0	9.191	12.757	10.805	12.291	9.706	13.06	104.00	1.389	-8.857	1.678	-12.7752
710	1300.0	9.089	12.706	10.715	12.278	9.703	12.84	106.06	1.263 - 9	-8.899	1.500 -13	-12.8239
720	1300.0	8.987	12.655	10.626	12.266	9.700	12.62	108.26	1.150	-8.939	1.343	-12.8721
730	1300.0	8.885	12.604	10.537	12.253	9.696	12.39	110.59	1.050	-8.979	1.203	-12.9198
740	1300.0	8.784	12.553	10.448	12.240	9.693	12.15	113.06	9.598 -10	-9.018	1.079	-12.9670
750	1300.0	8.683	12.503	10.360	12.228	9.690	11.91	115.69	8.794	-9.056	9.688 -14	-13.0138
760	1300.0	8.582	12.452	10.272	12.215	9.687	11.66	118.48	8.074	-9.093	8.710	-13.0600
770	1300.0	8.482	12.402	10.184	12.202	9.684	11.41	121.44	7.428	-9.129	7.840	-13.1057
780	1300.0	8.382	12.352	10.096	12.190	9.680	11.15	124.57	6.848	-9.164	7.066	-13.1508
790	1300.0	8.282	12.302	10.009	12.177	9.677	10.89	127.88	6.327	-9.199	6.377	-13.1954
800	1300.0	8.182	12.252	9.922	12.165	9.674	10.63	131.37	5.857	-9.232	5.762	-13.2394
820	1300.0	7.984	12.153	9.748	12.140	9.668	10.11	138.92	5.051 -10	-9.297	4.725 -14	-13.3256
840	1300.0	7.786	12.055	9.575	12.115	9.662	9.59	147.25	4.391	-9.357	3.898	-13.4092
860	1300.0	7.395	11.859	9.233	12.067	9.649	8.59	166.22	3.400	-9.469	2.703	-13.5681
900	1300.0	7.201	11.762	9.063	12.042	9.643	8.12	176.79	3.025	-9.519	2.274	-13.6432
920	1300.0	7.008	11.665	8.894	12.018	9.637	7.68	188.00	2.711	-9.567	1.927	-13.7152
940	1300.0	6.816	11.569	8.726	11.994	9.631	7.27	199.76	2.445	-9.612	1.645	-13.7839
960	1300.0	6.625	11.474	8.559	11.970	9.625	6.89	211.93	2.219	-9.654	1.414	-13.8495
980	1300.0	6.435	11.379	8.392	11.947	9.619	6.54	224.39	2.024	-9.694	1.225	-13.9117
1000	1300.0	6.247	11.285	8.227	11.923	9.613	6.23	236.99	1.856	-9.731	1.070	-13.9708

WINTER MODEL, EXOSPHERIC TEMPERATURE = 1500° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_3)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
120	333.3	17.056	16.985	17.764	13.568		27.12	10.82	3.639 - 5	-4.439	5.561 - 8	-7.4484
125	429.0	16.739	16.772	17.472	13.474		26.81	14.10	2.432	-4.614	1.828	-7.7379
130	516.3	16.491	16.608	17.246	13.403		26.54	17.17	1.765	-4.753	1.092	-7.9819
135	594.5	16.288	16.476	17.061	13.347		26.30	19.99	1.349	-4.870	7.174 - 9	-8.1442
140	666.6	16.114	16.354	16.902	13.301		26.06	22.65	1.067	-4.972	5.015	-8.2997
145	732.6	15.961	16.267	16.763	13.261		25.84	25.15	8.651 - 6	-5.063	3.670	-8.4353
150	793.6	15.824	16.180	16.638	13.227		25.63	27.51	7.154	-5.145	2.779	-8.5562
155	849.4	15.699	16.103	16.525	13.197		25.42	29.73	6.008 - 6	-5.221	2.162 - 9	-8.6651
160	901.6	15.584	16.033	16.421	13.170		25.22	31.86	5.107	-5.292	1.718	-8.7649
165	950.3	15.477	15.968	16.325	13.145		25.02	33.89	4.386	-5.358	1.389	-8.8572
170	995.6	15.377	15.909	16.235	13.122		24.83	35.84	3.800	-5.420	1.140	-8.9431
175	1037.7	15.282	15.852	16.150	13.102		24.64	37.69	3.317	-5.479	9.475 -10	-9.0234
180	1077.0	15.193	15.799	16.070	13.083		24.46	39.48	2.914	-5.536	7.959	-9.0991
185	1113.6	15.108	15.749	15.993	13.065		24.28	41.19	2.574	-5.589	6.750	-9.1707
190	1147.8	15.026	15.702	15.920	13.048		24.10	42.83	2.285	-5.641	5.771	-9.2387
195	1179.5	14.948	15.657	15.850	13.032		23.92	44.41	2.038	-5.691	4.971	-9.3035
200	1209.2	14.873	15.614	15.783	13.018		23.75	45.93	1.824	-5.739	4.309	-9.3656
205	1236.7	14.800	15.572	15.718	13.004		23.58	47.39	1.639 - 6	-5.785	3.758 -10	-9.4251
210	1262.2	14.730	15.533	15.655	12.991		23.41	48.79	1.477	-5.831	3.295	-9.4822
215	1286.2	14.661	15.494	15.594	12.978		23.24	50.15	1.335	-5.874	2.901	-9.5374
220	1308.5	14.595	15.457	15.535	12.966		23.07	51.47	1.210	-5.917	2.566	-9.5907
225	1329.7	14.530	15.421	15.477	12.954		22.91	52.76	1.099	-5.959	2.278	-9.6424
230	1349.7	14.466	15.386	15.421	12.943		22.75	54.01	1.001	-6.000	2.029	-9.6927
235	1368.6	14.404	15.352	15.366	12.932		22.59	55.24	9.135 - 7	-6.039	1.813	-9.7415
240	1386.4	14.343	15.319	15.312	12.922		22.43	56.44	8.353	-6.078	1.625	-9.7891
245	1403.6	14.283	15.286	15.259	12.912		22.27	57.62	7.652	-6.116	1.460	-9.8355
250	1420.0	14.224	15.255	15.207	12.902		22.12	58.79	7.022	-6.154	1.316	-9.8808
255	1427.3	14.169	15.226	15.158	12.894		21.97	59.61	6.454 - 7	-6.190	1.194 -10	-9.9229
260	1434.6	14.114	15.197	15.109	12.886		21.82	60.41	5.938	-6.226	1.086	-9.9642
265	1441.1	14.059	15.169	15.061	12.878		21.67	61.19	5.469	-6.262	9.890 -11	-10.0048
270	1446.9	14.005	15.141	15.014	12.871		21.52	61.95	5.043	-6.297	9.021	-10.0448
275	1452.0	13.952	15.113	14.967	12.863		21.37	62.69	4.654	-6.332	8.239	-10.0841
280	1456.7	13.899	15.086	14.920	12.856		21.23	63.42	4.299	-6.367	7.535	-10.1229
285	1460.9	13.846	15.059	14.874	12.849		21.08	64.13	3.975	-6.401	6.900	-10.1612
290	1464.7	13.794	15.032	14.828	12.841		20.94	64.83	3.678	-6.434	6.326	-10.1989
295	1468.1	13.741	15.006	14.782	12.834		20.80	65.52	3.407	-6.468	5.806	-10.2361
300	1471.2	13.690	14.979	14.737	12.828		20.66	66.19	3.158	-6.501	5.334	-10.2729
310	1476.6	13.587	14.927	14.646	12.814		20.39	67.52	2.719 - 7	-6.566	4.517 -11	-10.3452
320	1480.9	13.485	14.876	14.557	12.800		20.13	68.81	2.348	-6.629	3.839	-10.4158
330	1484.4	13.384	14.825	14.468	12.787		19.88	70.06	2.033	-6.692	3.274	-10.4849
340	1487.3	13.283	14.774	14.380	12.774		19.63	71.29	1.765	-6.753	2.802	-10.5526
350	1489.7	13.184	14.724	14.293	12.762		19.39	72.50	1.536	-6.814	2.404	-10.6190
360	1491.6	13.084	14.674	14.206	12.749		19.16	73.68	1.339	-6.873	2.070	-10.6841
370	1493.1	12.986	14.624	14.120	12.736		18.94	74.83	1.171	-6.932	1.786	-10.7481
380	1494.4	12.888	14.575	14.034	12.724		18.73	75.97	1.025	-6.989	1.546	-10.8109
390	1495.4	12.790	14.526	13.948	12.711		18.53	77.08	8.996 - 8	-7.046	1.341	-10.8727
400	1496.3	12.692	14.477	13.863	12.699		18.34	78.17	7.908	-7.102	1.166	-10.9334

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log n(O_2)	log n(O)	log n(N_2)	log n(He)	log n(H)						
410	1497.0	12.595	14.429	13.778	12.687		18.15	79.24	6.965 - 8	-7.157	1.016 -11	-10.9932
420	1497.5	12.499	14.380	13.693	12.675		17.97	80.29	6.144	-7.212	8.869 -12	-11.0521
430	1498.0	12.403	14.332	13.609	12.663		17.80	81.32	5.429	-7.265	7.760	-11.1101
440	1498.4	12.307	14.284	13.525	12.651		17.64	82.33	4.804	-7.318	6.803	-11.1673
450	1498.7	12.211	14.236	13.441	12.639		17.48	83.33	4.258	-7.371	5.975	-11.2237
460	1498.9	12.116	14.188	13.358	12.627		17.33	84.31	3.779	-7.423	5.257	-11.2793
470	1499.1	12.021	14.141	13.274	12.615		17.19	85.27	3.359	-7.474	4.632	-11.3342
480	1499.3	11.926	14.093	13.192	12.603		17.05	86.22	2.989	-7.524	4.089	-11.3884
490	1499.4	11.832	14.046	13.109	12.591		16.92	87.16	2.663	-7.575	3.615	-11.4419
500	1499.5	11.737	13.999	13.027	12.579	9.474	16.79	88.09	2.376	-7.624	3.200	-11.4948
510	1499.6	11.644	13.952	12.944	12.567	9.471	16.67	89.02	2.122 - 8	-7.673	2.837 -12	-11.5471
520	1499.7	11.550	13.905	12.862	12.556	9.468	16.55	89.94	1.898	-7.722	2.518	-11.5989
530	1499.7	11.457	13.859	12.781	12.544	9.465	16.43	90.85	1.699	-7.770	2.239	-11.6503
540	1499.8	11.364	13.812	12.699	12.532	9.462	16.31	91.77	1.523	-7.817	1.992	-11.7007
550	1499.8	11.271	13.766	12.618	12.521	9.459	16.20	92.68	1.366	-7.864	1.775	-11.7508
560	1499.9	11.179	13.720	12.537	12.509	9.456	16.08	93.60	1.227	-7.911	1.583	-11.8005
570	1499.9	11.086	13.674	12.457	12.498	9.454	15.97	94.53	1.104	-7.957	1.413	-11.8497
580	1499.9	10.994	13.628	12.376	12.486	9.451	15.86	95.48	9.933 - 9	-8.003	1.263	-11.8985
590	1499.9	10.903	13.582	12.296	12.475	9.448	15.75	96.43	8.950	-8.048	1.130	-11.9468
600	1499.9	10.811	13.536	12.216	12.463	9.445	15.64	97.40	8.073	-8.093	1.012	-11.9947
610	1499.9	10.720	13.491	12.136	12.452	9.442	15.52	98.39	7.289 - 9	-8.137	9.073 -13	-12.0422
620	1500.0	10.629	13.445	12.057	12.441	9.439	15.41	99.41	6.588	-8.181	8.140	-12.0894
630	1500.0	10.539	13.400	11.977	12.429	9.436	15.29	100.45	5.960	-8.225	7.309	-12.1361
640	1500.0	10.449	13.355	11.898	12.418	9.433	15.17	101.53	5.398	-8.268	6.569	-12.1825
650	1500.0	10.358	13.310	11.819	12.407	9.431	15.05	102.64	4.895	-8.310	5.908	-12.2285
660	1500.0	10.269	13.265	11.741	12.395	9.428	14.93	103.79	4.443	-8.352	5.318	-12.2742
670	1500.0	10.179	13.220	11.662	12.384	9.425	14.80	104.98	4.037	-8.394	4.791	-12.3195
680	1500.0	10.090	13.175	11.584	12.373	9.422	14.67	106.22	3.672	-8.435	4.320	-12.3645
690	1500.0	10.001	13.131	11.506	12.362	9.419	14.54	107.51	3.344	-8.476	3.898	-12.4092
700	1500.0	9.912	13.086	11.428	12.351	9.417	14.40	108.86	3.049	-8.516	3.519	-12.4535
710	1500.0	9.823	13.042	11.351	12.340	9.414	14.25	110.27	2.783 - 9	-8.556	3.180 -13	-12.4975
720	1500.0	9.735	12.998	11.274	12.329	9.411	14.10	111.74	2.543	-8.595	2.876	-12.5412
730	1500.0	9.647	12.954	11.197	12.318	9.408	13.95	113.29	2.327	-8.633	2.603	-12.5845
740	1500.0	9.559	12.910	11.120	12.307	9.405	13.79	114.91	2.132	-8.671	2.358	-12.6275
750	1500.0	9.472	12.866	11.043	12.296	9.403	13.63	116.62	1.955	-8.709	2.137	-12.6702
760	1500.0	9.384	12.823	10.967	12.285	9.400	13.46	118.41	1.796	-8.746	1.938	-12.7126
770	1500.0	9.297	12.779	10.890	12.274	9.397	13.29	120.29	1.651	-8.782	1.760	-12.7546
780	1500.0	9.211	12.736	10.814	12.263	9.394	13.11	122.27	1.521	-8.818	1.599	-12.7963
790	1500.0	9.124	12.692	10.739	12.252	9.392	12.93	124.35	1.402	-8.853	1.453	-12.8376
800	1500.0	9.038	12.649	10.663	12.241	9.389	12.74	126.54	1.295	-8.888	1.322	-12.8786
820	1500.0	8.866	12.563	10.512	12.220	9.384	12.35	131.26	1.109 - 9	-8.955	1.098 -13	-12.9595
840	1500.0	8.695	12.478	10.363	12.199	9.378	11.94	136.49	9.546 -10	-9.020	9.142 -14	-13.0390
860	1500.0	8.526	12.393	10.216	12.178	9.373	11.52	142.29	8.207	-9.086	7.859	-13.1047
880	1500.0	8.356	12.308	10.066	12.156	9.368	11.09	148.59	7.207	-9.142	6.410	-13.1932
900	1500.0	8.187	12.224	9.919	12.135	9.362	10.65	155.55	6.318	-9.199	5.398	-13.2678
920	1500.0	8.020	12.141	9.772	12.114	9.357	10.22	163.14	5.572	-9.254	4.564	-13.3406
940	1500.0	7.854	12.057	9.627	12.093	9.352	9.78	171.38	4.944	-9.306	3.876	-13.4116
960	1500.0	7.688	11.975	9.482	12.073	9.346	9.35	180.29	4.412	-9.355	3.306	-13.4807
980	1500.0	7.524	11.892	9.338	12.052	9.341	8.92	189.85	3.960	-9.402	2.833	-13.5477
1000	1500.0	7.360	11.811	9.195	12.032	9.336	8.52	200.04	3.574	-9.447	2.440	-13.6126

WINTER MODEL, EXOSPHERIC TEMPERATURE = 1700° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
120	333.7	17.056	16.985	17.764	13.567		27.12	10.83	3.643 - 5	-4.438	3.561 - 8	-7.4484
125	430.4	16.738	16.771	17.472	13.473		26.82	14.15	2.437	-4.613	1.826	-7.7385
130	519.6	16.491	16.606	17.245	13.401		26.55	17.28	1.771	-4.752	1.089	-7.9631
135	600.8	16.287	16.473	17.059	13.345		26.30	20.20	1.356	-4.868	7.141 - 9	-8.1463
140	676.5	16.112	16.360	16.899	13.297		26.07	22.98	1.076	-4.968	4.985	-8.3023
145	746.5	15.959	16.262	14.760	13.257		25.85	25.61	8.755 - 6	-5.058	3.647	-8.4381
150	812.2	15.822	16.175	16.636	13.222		25.64	28.14	7.268	-5.139	2.760	-8.5591
155	873.2	15.698	16.097	16.523	13.191		25.44	30.53	6.129 - 6	-5.213	2.148 - 9	-8.6680
160	930.9	15.584	16.026	16.419	13.163		25.25	32.85	5.234	-5.281	1.707	-8.7677
165	985.4	15.478	15.961	16.323	13.137		25.06	35.09	4.518	-5.345	1.382	-8.8595
170	1036.8	15.379	15.900	16.234	13.114		24.88	37.25	3.934	-5.405	1.135	-8.9449
175	1085.0	15.286	15.844	16.150	13.092		24.70	39.32	3.453	-5.462	9.453 -10	-9.0244
180	1130.6	15.198	15.791	16.071	13.073		24.52	41.33	3.050	-5.516	7.957	-9.0992
185	1173.3	15.115	15.741	15.996	13.054		24.35	43.26	2.710	-5.567	6.765	-9.1697
190	1213.7	15.035	15.694	15.925	13.037		24.18	45.13	2.420	-5.616	5.800	-9.2366
195	1251.8	14.959	15.649	15.856	13.021		24.02	46.94	2.171	-5.663	5.010	-9.3001
200	1287.8	14.886	15.607	15.791	13.006		23.86	48.69	1.956	-5.709	4.357	-9.3608
205	1321.6	14.816	15.566	15.728	12.991		23.70	50.39	1.768 - 6	-5.753	3.812 -10	-9.4188
210	1353.3	14.748	15.527	15.667	12.978		23.54	52.02	1.603	-5.795	3.354	-9.4744
215	1383.2	14.682	15.489	15.609	12.965		23.38	53.60	1.459	-5.836	2.966	-9.5279
220	1411.2	14.619	15.453	15.552	12.952		23.23	55.13	1.330	-5.876	2.634	-9.5794
225	1437.7	14.557	15.418	15.497	12.941		23.08	56.62	1.217	-5.915	2.349	-9.6292
230	1462.7	14.497	15.384	15.443	12.930		22.93	58.07	1.115	-5.953	2.102	-9.6773
235	1486.5	14.438	15.352	15.391	12.919		22.78	59.48	1.024	-5.990	1.888	-9.7240
240	1509.1	14.381	15.320	15.340	12.908		22.64	60.86	9.424 - 7	-6.026	1.700	-9.7694
245	1530.8	14.324	15.288	15.290	12.898		22.50	62.27	8.689	-6.061	1.535	-9.8139
250	1554.1	14.269	15.257	15.240	12.886		22.36	63.67	8.026	-6.095	1.389	-9.8574
255	1572.3	14.215	15.228	15.193	12.879		22.22	64.91	7.426 - 7	-6.129	1.262 -10	-9.8989
260	1588.0	14.164	15.201	15.148	12.871		22.08	65.86	6.879	-6.162	1.154	-9.9378
265	1592.8	14.114	15.175	15.104	12.863		21.94	66.78	6.380	-6.195	1.057	-9.9759
270	1601.7	14.064	15.148	15.060	12.854		21.81	67.67	5.923	-6.227	9.699 -11	-10.0133
275	1609.9	14.015	15.123	15.017	12.849		21.67	68.54	5.503	-6.259	8.912	-10.0500
280	1617.4	13.967	15.097	14.974	12.842		21.54	69.39	5.118	-6.291	8.199	-10.0862
285	1624.3	13.918	15.072	14.931	12.835		21.41	.21	4.765	-6.322	7.556	-10.1218
290	1630.7	13.871	15.048	14.889	12.828		21.28	.02	4.439	-6.353	6.968	-10.1572
295	1636.4	13.823	15.023	14.848	12.821		21.15	..82	4.139	-6.383	6.435	-10.1915
300	1641.8	13.776	14.999	14.806	12.815		21.03	72.59	3.862	-6.413	5.949	-10.2255
310	1651.1	13.683	14.951	14.724	12.802		20.78	74.10	3.370 - 7	-6.472	5.101 -11	-10.2924
320	1658.9	13.591	14.904	14.644	12.789		20.53	75.56	2.948	-6.530	4.390	-10.3576
330	1665.5	13.500	14.858	14.564	12.777		20.30	76.98	2.586	-6.587	3.791	-10.4213
340	1671.0	13.410	14.812	14.485	12.765		20.07	78.35	2.274	-6.643	3.284	-10.4836
350	1675.6	13.321	14.767	14.406	12.753		19.84	79.69	2.003	-6.698	2.854	-10.5446
360	1679.5	13.232	14.722	14.329	12.742		19.63	81.00	1.769	-6.752	2.486	-10.6044
370	1682.8	13.144	14.678	14.251	12.730		19.42	82.28	1.565	-6.805	2.172	-10.6632
380	1685.6	13.057	14.633	14.175	12.719		19.21	83.54	1.387	-6.858	1.902	-10.7208
390	1687.9	12.970	14.590	14.099	12.708		19.02	84.77	1.232	-6.909	1.669	-10.7775
400	1689.8	12.883	14.546	14.023	12.697		18.83	85.97	1.096	-6.960	1.468	-10.8332

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
410	1691.4	12.797	14.503	13.947	12.686		18.65	87.15	9.761 - 8	-7.010	1.294 -11	-10.8880
420	1692.8	12.711	14.460	13.872	12.675		18.47	88.31	8.710	-7.060	1.143	-10.9420
430	1694.0	12.626	14.417	13.797	12.664		18.30	89.45	7.783	-7.109	1.011	-10.9951
440	1694.9	12.541	14.374	13.723	12.653		18.14	90.57	6.965	-7.157	8.964 -12	-11.0475
450	1695.7	12.456	14.332	13.649	12.642		17.98	91.68	6.241	-7.205	7.959	-11.0991
460	1696.4	12.372	14.290	13.575	12.632		17.83	92.76	5.599	-7.252	7.079	-11.1500
470	1697.0	12.288	14.248	13.501	12.621		17.69	93.83	5.030	-7.298	6.305	-11.2003
480	1697.5	12.204	14.206	13.428	12.611		17.55	94.88	4.524	-7.344	5.625	-11.2499
490	1697.9	12.121	14.164	13.355	12.600		17.41	95.91	4.074	-7.390	5.025	-11.2989
500	1698.2	12.038	14.122	13.282	12.590	9.249	17.28	96.94	3.673	-7.435	4.495	-11.3472
510	1698.5	11.955	14.081	13.210	12.579	9.246	17.16	97.94	3.315 - 8	-7.480	4.027 -12	-11.3950
520	1698.7	11.872	14.039	13.137	12.569	9.244	17.04	98.94	2.994	-7.524	3.612	-11.4423
530	1698.9	11.790	13.998	13.065	12.559	9.241	16.92	99.93	2.708	-7.567	3.243	-11.4890
540	1699.1	11.708	13.957	12.993	12.548	9.238	16.80	100.91	2.451	-7.611	2.916	-11.5353
550	1699.3	11.626	13.916	12.922	12.538	9.236	16.69	101.85	2.221	-7.653	2.624	-11.5810
560	1699.4	11.544	13.875	12.850	12.528	9.233	16.58	102.86	2.014	-7.696	2.364	-11.6263
570	1699.5	11.463	13.835	12.779	12.518	9.231	16.48	103.82	1.829	-7.738	2.133	-11.6711
580	1699.6	11.382	13.794	12.708	12.508	9.228	16.37	104.79	1.661	-7.780	1.925	-11.7155
590	1699.6	11.301	13.754	12.637	12.497	9.225	16.27	105.76	1.511	-7.821	1.740	-11.7595
600	1699.7	11.220	13.713	12.566	12.487	9.223	16.17	106.73	1.375	-7.862	1.574	-11.8031
610	1699.7	11.140	13.673	12.496	12.477	9.220	16.07	107.70	1.253 - 8	-7.902	1.425 -12	-11.8463
620	1699.8	11.059	13.633	12.426	12.467	9.218	15.97	108.69	1.142	-7.942	1.291	-11.8892
630	1699.8	10.980	13.593	12.356	12.457	9.215	15.87	109.68	1.042	-7.982	1.170	-11.9316
640	1699.8	10.900	13.553	12.286	12.447	9.213	15.77	110.69	9.517 - 9	-8.021	1.062	-11.9738
650	1699.9	10.820	13.513	12.217	12.437	9.210	15.67	111.71	8.699	-8.061	9.648 -13	-12.0156
660	1699.9	10.741	13.474	12.147	12.427	9.208	15.58	112.74	7.957	-8.099	8.769	-12.0570
670	1699.9	10.662	13.434	12.078	12.418	9.205	15.47	113.80	7.285	-8.138	7.976	-12.0982
680	1699.9	10.583	13.395	12.009	12.408	9.203	15.37	114.88	6.675	-8.176	7.260	-12.1391
690	1699.9	10.505	13.356	11.940	12.398	9.200	15.27	115.99	6.121	-8.213	6.613	-12.1796
700	1699.9	10.426	13.316	11.872	12.388	9.198	15.17	117.12	5.618	-8.250	6.027	-12.2199
710	1700.0	10.348	13.277	11.803	12.378	9.195	15.06	118.29	5.160 - 9	-8.287	5.498 -13	-12.2598
720	1700.0	10.270	13.238	11.735	12.369	9.193	14.95	119.49	4.744	-8.324	5.017	-12.2995
730	1700.0	10.193	13.200	11.667	12.359	9.190	14.84	120.72	4.365	-8.360	4.582	-12.3389
740	1700.0	10.115	13.161	11.599	12.349	9.188	14.72	122.00	4.020	-8.396	4.187	-12.3781
750	1700.0	10.038	13.122	11.531	12.339	9.186	14.61	123.32	3.705	-8.431	3.829	-12.4169
760	1700.0	9.961	13.084	11.464	12.330	9.183	14.49	124.69	3.418	-8.466	3.503	-12.4555
770	1700.0	9.884	13.045	11.397	12.320	9.181	14.36	126.11	3.156	-8.501	3.207	-12.4939
780	1700.0	9.807	13.007	11.330	12.311	9.178	14.24	127.59	2.917	-8.535	2.938	-12.5319
790	1700.0	9.731	12.969	11.263	12.301	9.176	14.11	129.12	2.698	-8.569	2.693	-12.5697
800	1700.0	9.655	12.931	11.196	12.292	9.173	13.98	130.71	2.498	-8.602	2.470	-12.6073
820	1700.0	9.503	12.855	11.063	12.273	9.169	13.70	134.10	2.148 - 9	-8.668	2.082 -13	-12.6816
840	1700.0	9.352	12.779	10.931	12.254	9.164	13.41	137.79	1.854	-8.732	1.759	-12.7548
860	1700.0	9.053	12.630	10.669	12.216	9.155	12.78	146.16	1.398	-8.854	1.264	-12.8981
900	1700.0	8.905	12.556	10.539	12.198	9.150	12.45	150.92	1.222	-8.913	1.076	-12.9681
920	1700.0	8.757	12.482	10.410	12.179	9.145	12.10	156.10	1.073	-8.970	9.183 -14	-13.0370
940	1700.0	8.610	12.408	10.282	12.161	9.141	11.74	161.74	9.458 -10	-9.024	7.857	-13.1047
960	1700.0	8.464	12.335	10.154	12.143	9.136	11.38	167.86	8.377	-9.077	6.742	-13.1712
980	1700.0	8.319	12.263	10.027	12.124	9.131	11.00	174.49	7.453	-9.128	5.802	-13.2364
1000	1700.0	8.175	12.191	9.901	12.106	9.127	10.63	181.66	6.661	-9.176	5.008	-13.3003

WINTER MODEL, EXOSPHERIC TEMPERATURE = 1900° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
120	333.4	17.056	16.985	17.764	13.568		27.12	10.82	3.644 - 5	-4.438	3.565 - 8	-7.4480
125	429.8	16.739	16.771	17.472	13.473		26.82	14.13	2.436	-4.613	1.328	-7.7381
130	519.5	16.490	16.606	17.244	13.401		26.55	17.28	1.770	-4.752	1.088	-7.9634
135	602.2	16.286	16.471	17.057	13.344		26.30	20.25	1.356	-4.868	7.121 - 9	-8.1475
140	680.2	16.110	16.357	16.897	13.296		26.07	23.10	1.076	-4.968	4.961	-8.3045
145	753.3	15.956	16.258	16.757	13.255		25.86	25.84	8.771 - 6	-5.057	3.621	-8.4412
150	822.6	15.819	16.170	16.632	13.219		25.65	28.49	7.296	-5.137	2.736	-8.5629
155	888.1	15.696	16.091	16.519	13.187		25.45	31.04	6.167 - 6	-5.210	2.126 - 9	-8.6725
160	950.3	15.580	16.019	16.415	13.158		25.26	33.52	5.282	-5.277	1.689	-8.7724
165	1009.3	15.474	15.953	16.319	13.132		25.08	35.92	4.574	-5.340	1.367	-8.8643
170	1065.6	15.376	15.892	16.230	13.108		24.90	38.25	3.997	-5.398	1.123	-8.9495
175	1119.4	15.283	15.835	16.146	13.085		24.73	40.53	3.520	-5.453	9.352 -10	-9.0291
180	1170.7	15.196	15.782	16.067	13.065		24.56	42.74	3.122	-5.506	7.876	-9.1037
185	1219.5	15.113	15.732	15.993	13.046		24.39	44.89	2.785	-5.555	6.700	-9.1739
190	1265.9	15.035	15.685	15.922	13.028		24.23	46.98	2.498	-5.602	5.751	-9.2403
195	1309.9	14.960	15.640	15.855	13.011		24.07	49.00	2.251	-5.648	4.975	-9.3032
200	1351.8	14.889	15.597	15.791	12.996		23.92	50.98	2.037	-5.691	4.334	-9.3631
205	1391.7	14.820	15.556	15.729	12.981		23.77	52.89	1.850 - 6	-5.733	3.799 -10	-9.4203
210	1429.5	14.754	15.518	15.670	12.967		23.62	54.76	1.686	-5.773	3.350	-9.4750
215	1465.4	14.690	15.480	15.612	12.953		23.47	56.57	1.541	-5.812	2.969	-9.5275
220	1499.3	14.628	15.445	15.557	12.941		23.33	58.32	1.412	-5.850	2.643	-9.5779
225	1531.8	14.568	15.410	15.504	12.929		23.19	60.04	1.298	-5.887	2.363	-9.6265
230	1562.7	14.510	15.377	15.452	12.917		23.05	61.71	1.196	-5.922	2.121	-9.6734
235	1591.9	14.454	15.344	15.401	12.906		22.91	63.34	1.104	-5.957	1.911	-9.7188
240	1619.5	14.399	15.313	15.352	12.896		22.78	64.91	1.021	-5.991	1.727	-9.7627
245	1646.7	14.345	15.283	15.304	12.885		22.65	66.49	9.461 - 7	-6.024	1.565	-9.8055
250	1673.0	14.293	15.253	15.257	12.875		22.52	68.05	8.784	-6.056	1.422	-9.8471
255	1697.7	14.241	15.224	15.212	12.866		22.39	69.56	8.168 - 7	-6.088	1.296 -10	-9.8875
260	1712.4	14.193	15.198	15.169	12.858		22.26	70.66	7.606	-6.119	1.189	-9.9247
265	1726.0	14.146	15.173	15.127	12.850		22.13	71.74	7.090	-6.149	1.094	-9.9611
270	1738.6	14.099	15.148	15.086	12.843		22.01	72.78	6.617	-6.179	1.007	-9.9968
275	1750.3	14.053	15.123	15.045	12.836		21.89	73.80	6.180	-6.209	9.295 -11	-10.0318
280	1761.2	14.007	15.099	15.005	12.829		21.76	74.78	5.778	-6.238	8.588	-10.0661
285	1771.2	13.962	15.075	14.965	12.822		21.64	75.75	5.407	-6.267	7.946	-10.0999
290	1780.6	13.918	15.052	14.926	12.815		21.52	76.69	5.063	-6.296	7.361	-10.1330
295	1789.2	13.874	15.029	14.887	12.808		21.40	77.60	4.746	-6.324	6.828	-10.1657
300	1797.3	13.830	15.006	14.849	12.802		21.29	78.50	4.451	-6.352	6.341	-10.1978
310	1811.6	13.744	14.961	14.773	12.789		21.06	80.23	3.924 - 7	-6.406	5.486 -11	-10.2608
320	1824.0	13.659	14.917	14.698	12.777		20.83	81.90	3.469	-6.460	4.765	-10.3220
330	1834.6	13.576	14.874	14.625	12.766		20.61	83.51	3.074	-6.512	4.153	-10.3816
340	1843.8	13.493	14.832	14.552	12.754		20.39	85.07	2.730	-6.564	3.632	-10.4398
350	1851.6	13.411	14.790	14.480	12.743		20.18	86.58	2.430	-6.614	3.186	-10.4968
360	1858.4	13.331	14.749	14.409	12.732		19.98	88.04	2.167	-6.664	2.802	-10.5525
370	1864.2	13.250	14.708	14.339	12.722		19.78	89.47	1.936	-6.713	2.471	-10.6072
380	1869.2	13.171	14.668	14.269	12.711		19.59	90.87	1.733	-6.761	2.184	-10.6607
390	1873.5	13.092	14.628	14.200	12.701		19.40	92.23	1.554	-6.809	1.935	-10.7133
400	1877.2	13.014	14.588	14.132	12.690		19.22	93.56	1.395	-6.855	1.718	-10.7650

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
410	1880.4	12.936	14.549	14.063	12.680		19.04	94.87	1.255 - 7	-6.902	1.528 -11	-10.8159
420	1883.1	12.859	14.510	13.996	12.670		18.87	96.15	1.130	-6.947	1.362	-10.8659
430	1885.5	12.782	14.471	13.928	12.661		18.71	97.40	1.019	-6.992	1.216	-10.9151
440	1887.5	12.705	14.433	13.861	12.651		18.55	98.64	9.201 - 8	-7.036	1.087	-10.9636
450	1889.3	12.629	14.395	13.794	12.641		18.39	99.85	8.319	-7.080	9.741 -12	-11.0114
460	1890.8	12.553	14.356	13.728	12.631		18.24	101.04	7.531	-7.123	8.740	-11.0585
470	1892.1	12.477	14.319	13.662	12.622		18.10	102.22	6.825	-7.166	7.853	-11.1053
480	1893.2	12.402	14.281	13.596	12.612		17.96	103.37	6.192	-7.208	7.066	-11.1508
490	1894.1	12.327	14.243	13.530	12.603		17.83	104.51	5.624	-7.250	6.367	-11.1961
500	1894.9	12.253	14.206	13.465	12.593	9.077	17.70	105.63	5.114	-7.291	5.744	-11.2408
510	1895.7	12.178	14.169	13.400	12.584	9.075	17.57	106.73	4.654 - 8	-7.332	5.189 -12	-11.2849
520	1896.3	12.104	14.131	13.335	12.575	9.072	17.45	107.82	4.240	-7.373	4.693	-11.3286
530	1896.8	12.030	14.094	13.270	12.565	9.070	17.33	108.90	3.866	-7.413	4.249	-11.3717
540	1897.2	11.957	14.058	13.206	12.556	9.067	17.22	109.97	3.529	-7.452	3.852	-11.4144
550	1897.6	11.883	14.021	13.141	12.547	9.065	17.11	111.02	3.223	-7.492	3.495	-11.4566
560	1898.0	11.810	13.984	13.077	12.538	9.063	17.00	112.07	2.947	-7.531	3.175	-11.4983
570	1898.2	11.737	13.948	13.013	12.528	9.060	16.89	113.11	2.697	-7.569	2.886	-11.5396
580	1898.5	11.664	13.911	12.950	12.519	9.058	16.79	114.14	2.469	-7.607	2.627	-11.5805
590	1898.7	11.592	13.875	12.886	12.510	9.056	16.69	115.17	2.263	-7.645	2.393	-11.6211
600	1898.9	11.520	13.839	12.823	12.501	9.053	16.60	116.19	2.076	-7.683	2.182	-11.6612
610	1899.0	11.448	13.803	12.760	12.492	9.051	16.50	117.21	1.905 - 8	-7.720	1.991 -12	-11.7009
620	1899.2	11.376	13.767	12.697	12.483	9.049	16.41	118.23	1.750	-7.757	1.818	-11.7403
630	1899.3	11.304	13.731	12.635	12.474	9.046	16.31	119.24	1.609	-7.794	1.662	-11.7794
640	1899.4	11.233	13.696	12.572	12.465	9.044	16.22	120.27	1.480	-7.830	1.520	-11.8181
650	1899.5	11.162	13.660	12.510	12.456	9.042	16.13	121.29	1.362	-7.866	1.391	-11.8565
660	1899.5	11.091	13.625	12.448	12.447	9.040	16.04	122.32	1.255	-7.901	1.275	-11.8946
670	1899.6	11.020	13.589	12.386	12.439	9.037	15.95	123.36	1.157	-7.937	1.168	-11.9324
680	1899.7	10.950	13.554	12.324	12.430	9.035	15.86	124.41	1.067	-7.972	1.072	-11.9699
690	1899.7	10.879	13.519	12.262	12.421	9.033	15.77	125.47	9.850 - 9	-8.007	9.837 -13	-12.0071
700	1899.8	10.809	13.484	12.201	12.412	9.031	15.69	126.54	9.098	-8.041	9.035	-12.0441
710	1899.8	10.739	13.449	12.140	12.403	9.028	15.60	127.63	8.410 - 9	-8.075	8.304 -13	-12.0807
720	1899.8	10.670	13.414	12.079	12.395	9.026	15.51	128.74	7.779	-8.109	7.636	-12.1171
730	1899.8	10.600	13.379	12.018	12.386	9.024	15.42	129.87	7.200	-8.143	7.026	-12.1533
740	1899.9	10.531	13.344	11.957	12.377	9.022	15.32	131.02	6.668	-8.176	6.469	-12.1892
750	1899.9	10.462	13.310	11.897	12.369	9.020	15.23	132.19	6.181	-8.209	5.959	-12.2248
760	1899.9	10.393	13.275	11.836	12.360	9.018	15.14	133.39	5.732	-8.242	5.493	-12.2602
770	1899.9	10.324	13.241	11.776	12.351	9.015	15.04	134.61	5.320	-8.274	5.065	-12.2954
780	1899.9	10.255	13.207	11.716	12.343	9.013	14.95	135.87	4.941	-8.306	4.674	-12.3303
790	1899.9	10.187	13.173	11.656	12.334	9.011	14.84	137.17	4.592	-8.338	4.315	-12.3650
800	1899.9	10.119	13.138	11.597	12.326	9.009	14.74	138.49	4.270	-8.370	3.986	-12.3995
820	1900.0	9.983	13.071	11.478	12.309	9.005	14.53	141.27	3.701 - 9	-8.432	3.406 -13	-12.4678
840	1900.0	9.848	13.003	11.360	12.292	9.000	14.32	144.22	3.217	-8.492	2.916	-12.5352
860	1900.0	9.580	12.869	11.125	12.258	8.992	13.85	150.74	2.453	-8.610	2.150	-12.6675
900	1900.0	9.448	12.803	11.009	12.242	8.988	13.60	154.36	2.151	-8.667	1.852	-12.7323
920	1900.0	9.316	12.737	10.893	12.225	8.984	13.34	158.24	1.893	-8.723	1.598	-12.7963
940	1900.0	9.184	12.671	10.779	12.209	8.979	13.07	162.42	1.671	-8.777	1.382	-12.8595
960	1900.0	9.054	12.606	10.664	12.193	8.975	12.79	166.92	1.480	-8.830	1.198	-12.9217
980	1900.0	8.924	12.541	10.550	12.176	8.971	12.49	171.77	1.315	-8.881	1.040	-12.9831
1000	1900.0	8.795	12.476	10.437	12.160	8.967	12.19	176.98	1.172	-8.931	9.047 -14	-13.0435

WINTER MODEL, EXOSPHERIC TEMPERATURE = 2100° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
120	333.1	17.056	16.985	17.764	13.568		27.12	10.81	3.641 - 5	-4.439	3.565 - 8	-7.4479
125	429.8	16.738	16.771	17.472	13.473		26.82	14.13	2.433	-4.614	1.826	-7.7385
130	520.6	16.489	16.605	17.243	13.401		26.55	17.31	1.769	-4.752	1.085	-7.9646
135	605.1	16.284	16.469	17.055	13.343		26.30	20.34	1.356	-4.868	7.088 - 9	-8.1495
140	685.4	16.108	16.354	16.895	13.294		26.07	23.28	1.078	-4.967	4.931	-8.3071
145	761.1	15.954	16.255	16.754	13.252		25.86	26.11	8.801 - 6	-5.055	3.596	-8.4441
150	833.4	15.816	16.166	16.629	13.216		25.66	28.86	7.336	-5.135	2.716	-8.5661
155	902.2	15.692	16.087	16.516	13.183		25.46	31.53	6.216 - 6	-5.206	2.110 - 9	-8.6758
160	968.3	15.577	16.014	16.417	13.153		25.27	34.14	5.338	-5.273	1.676	-8.7758
165	1031.9	15.472	15.947	16.316	13.127		25.09	36.70	4.635	-5.334	1.356	-8.8679
170	1092.9	15.374	15.886	16.227	13.107		24.92	39.20	4.062	-5.391	1.114	-8.9531
175	1151.3	15.282	15.829	16.144	13.079		24.75	41.64	3.590	-5.445	9.282 -10	-9.0323
180	1207.5	15.195	15.775	16.065	13.059		24.59	44.02	3.194	-5.496	7.823	-9.1066
185	1261.6	15.114	15.725	15.991	13.039		24.43	46.37	2.860	-5.544	6.660	-9.1765
190	1313.3	15.036	15.677	15.921	13.020		24.28	48.65	2.574	-5.589	5.722	-9.2424
195	1362.6	14.962	15.632	15.855	13.003		24.13	50.87	2.328	-5.633	4.957	-9.3048
200	1409.9	14.892	15.590	15.791	12.987		23.98	53.04	2.114	-5.675	4.325	-9.3641
205	1455.1	14.825	15.549	15.731	12.972		23.83	55.15	1.928 - 6	-5.715	3.797 -10	-9.4205
210	1498.2	14.760	15.511	15.672	12.957		23.69	57.21	1.763	-5.754	3.354	-9.4744
215	1539.5	14.697	15.473	15.616	12.944		23.55	59.23	1.618	-5.791	2.978	-9.5261
220	1578.9	14.637	15.438	15.562	12.931		23.42	61.19	1.489	-5.827	2.657	-9.5756
225	1616.6	14.579	15.404	15.510	12.918		23.28	63.10	1.374	-5.862	2.381	-9.6233
230	1652.5	14.523	15.371	15.460	12.907		23.15	64.97	1.271	-5.896	2.142	-9.6692
235	1687.1	14.468	15.339	15.411	12.895		23.02	66.80	1.178	-5.929	1.934	-9.7135
240	1720.2	14.415	15.308	15.363	12.885		22.90	68.59	1.094	-5.961	1.752	-9.7565
245	1752.1	14.363	15.278	15.317	12.874		22.77	70.35	1.018	-5.992	1.592	-9.7981
250	1782.8	14.313	15.249	15.272	12.864		22.65	72.08	9.493 - 7	-6.023	1.451	-9.8384
255	1811.9	14.264	15.221	15.228	12.854		22.53	73.76	8.865 - 7	-6.052	1.326 -10	-9.8775
260	1830.5	14.218	15.196	15.187	12.846		22.41	75.03	8.289	-6.082	1.221	-9.9135
265	1847.9	14.172	15.171	15.147	12.839		22.29	76.26	7.759	-6.110	1.126	-9.9485
270	1864.2	14.128	15.147	15.107	12.831		22.18	77.45	7.270	-6.138	1.040	-9.9829
275	1879.4	14.084	15.123	15.069	12.824		22.06	78.61	6.819	-6.166	9.627 -11	-10.0165
280	1893.6	14.041	15.100	15.030	12.817		21.95	79.74	6.401	-6.194	8.924	-10.0495
285	1907.0	13.998	15.077	14.993	12.810		21.83	80.83	6.015	-6.221	8.284	-10.0818
290	1919.4	13.956	15.055	14.956	12.804		21.72	81.90	5.657	-6.247	7.700	-10.1135
295	1931.1	13.915	15.033	14.919	12.797		21.61	82.95	5.324	-6.274	7.166	-10.1447
300	1942.0	13.874	15.011	14.883	12.791		21.50	83.97	5.014	-6.300	6.678	-10.1754
310	1961.7	13.793	14.969	14.811	12.778		21.29	85.94	4.457 - 7	-6.351	5.817 -11	-10.2353
320	1979.0	13.714	14.927	14.741	12.767		21.08	87.83	3.973	-6.401	5.089	-10.2934
330	1994.1	13.636	14.886	14.673	12.755		20.87	89.64	3.550	-6.450	4.468	-10.3499
340	2007.3	13.559	14.847	14.605	12.744		20.67	91.39	3.178	-6.498	3.936	-10.4050
350	2018.9	13.483	14.807	14.539	12.734		20.47	93.08	2.852	-6.545	3.478	-10.4587
360	2029.0	13.408	14.769	14.473	12.723		20.28	94.72	2.564	-6.591	3.081	-10.5112
370	2037.9	13.334	14.731	14.408	12.713		20.09	96.31	2.309	-6.637	2.737	-10.5627
380	2045.7	13.261	14.694	14.343	12.703		19.91	97.86	2.083	-6.681	2.438	-10.6130
390	2052.4	13.189	14.657	14.280	12.693		19.73	99.37	1.882	-6.725	2.176	-10.6624
400	2058.4	13.117	14.620	14.217	12.684		19.55	100.84	1.703	-6.769	1.946	-10.7109

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
410	2063.6	13.045	14.584	14.154	12.674		19.38	102.28	1.544 - 7	-6.811	1.744 -11	-10.7585
420	2068.1	12.974	14.548	14.092	12.665		19.22	103.69	1.401	-6.854	1.566	-10.8053
430	2072.1	12.904	14.512	14.030	12.656		19.06	105.06	1.273	-6.895	1.408	-10.8514
440	2075.6	12.834	14.477	13.969	12.646		18.90	106.42	1.158	-6.936	1.268	-10.8967
450	2078.6	12.764	14.442	13.908	12.637		18.75	107.74	1.055	-6.977	1.144	-10.9414
460	2081.3	12.695	14.407	13.847	12.628		18.61	109.05	9.617 - 8	-7.017	1.034	-10.9854
470	2083.6	12.626	14.372	13.787	12.620		18.47	110.33	8.779	-7.057	9.358 -12	-11.0288
480	2085.7	12.558	14.338	13.727	12.611		18.33	111.59	8.023	-7.096	8.480	-11.0716
490	2087.5	12.490	14.303	13.667	12.602		18.20	112.83	7.339	-7.134	7.694	-11.1138
500	2089.0	12.422	14.269	13.608	12.593	8.945	18.07	114.05	6.720	-7.173	6.990	-11.1555
510	2090.4	12.354	14.235	13.548	12.585	8.943	17.94	115.26	6.158 - 8	-7.211	6.358 -12	-11.1967
520	2091.6	12.287	14.202	13.489	12.576	8.941	17.82	116.45	5.649	-7.248	5.789	-11.2374
530	2092.7	12.220	14.168	13.431	12.568	8.938	17.70	117.62	5.187	-7.285	5.277	-11.2776
540	2093.6	12.153	14.134	13.372	12.559	8.936	17.59	118.78	4.766	-7.322	4.816	-11.3173
550	2094.4	12.086	14.101	13.314	12.551	8.934	17.48	119.93	4.383	-7.358	4.399	-11.3566
560	2095.1	12.020	14.068	13.256	12.543	8.931	17.37	121.06	4.034	-7.394	4.023	-11.3955
570	2095.7	11.954	14.035	13.198	12.534	8.929	17.27	122.18	3.715	-7.430	3.682	-11.4339
580	2096.2	11.888	14.002	13.140	12.526	8.927	17.17	123.29	3.425	-7.465	3.373	-11.4720
590	2096.7	11.823	13.969	13.083	12.518	8.925	17.07	124.39	3.159	-7.500	3.093	-11.5097
600	2097.1	11.757	13.936	13.025	12.509	8.923	16.97	125.49	2.916	-7.535	2.838	-11.5470
610	2097.5	11.692	13.903	12.968	12.501	8.921	16.88	126.57	2.694 - 8	-7.570	2.607 -12	-11.5839
620	2097.8	11.627	13.871	12.911	12.493	8.919	16.78	127.65	2.490	-7.604	2.396	-11.6205
630	2098.1	11.562	13.838	12.855	12.485	8.916	16.69	128.73	2.303	-7.638	2.204	-11.6568
640	2098.3	11.497	13.806	12.798	12.477	8.914	16.60	129.80	2.132	-7.671	2.029	-11.6928
650	2098.5	11.433	13.774	12.742	12.469	8.912	16.52	130.87	1.974	-7.705	1.869	-11.7284
660	2098.7	11.369	13.742	12.685	12.461	8.910	16.43	131.94	1.829	-7.738	1.723	-11.7638
670	2098.9	11.305	13.710	12.629	12.453	8.908	16.35	133.01	1.696	-7.770	1.589	-11.7988
680	2099.0	11.241	13.678	12.573	12.445	8.906	16.26	134.08	1.574	-7.803	1.467	-11.8336
690	2099.1	11.177	13.646	12.518	12.437	8.904	16.18	135.16	1.461	-7.835	1.355	-11.8681
700	2099.2	11.114	13.614	12.462	12.429	8.902	16.10	136.24	1.358	-7.867	1.252	-11.9023
710	2099.3	11.050	13.583	12.407	12.421	8.900	16.02	137.32	1.262 - 8	-7.899	1.158 -12	-11.9363
720	2099.4	10.987	13.551	12.351	12.413	8.898	15.94	138.42	1.174	-7.930	1.072	-11.9700
730	2099.5	10.924	13.520	12.296	12.405	8.896	15.86	139.52	1.092	-7.962	9.920 -13	-12.0035
740	2099.6	10.862	13.488	12.241	12.397	8.894	15.78	140.63	1.017	-7.993	9.189	-12.0367
750	2099.6	10.799	13.457	12.187	12.389	8.892	15.70	141.76	9.473 - 9	-8.024	8.517	-12.0697
760	2099.7	10.737	13.426	12.132	12.382	8.890	15.61	142.90	8.830	-8.054	7.898	-12.1025
770	2099.7	10.674	13.395	12.078	12.374	8.888	15.53	144.06	8.236	-8.084	7.328	-12.1350
780	2099.7	10.612	13.364	12.023	12.366	8.886	15.45	145.23	7.686	-8.114	6.802	-12.1674
790	2099.8	10.551	13.333	11.969	12.358	8.884	15.37	146.42	7.176	-8.144	6.317	-12.1995
800	2099.8	10.489	13.302	11.915	12.351	8.882	15.28	147.63	6.704	-8.174	5.870	-12.2314
820	2099.8	10.366	13.240	11.808	12.335	8.878	15.12	150.13	5.862 - 9	-8.232	5.075 -13	-12.2946
840	2099.9	10.244	13.179	11.701	12.320	8.875	14.94	152.73	5.130	-8.289	4.39[illegible]	-12.3570
860	2099.9	10.002	13.058	11.489	12.290	8.867	14.57	158.32	3.971	-8.401	3.315	-12.4795
900	2099.9	9.882	12.998	11.383	12.275	8.863	14.38	161.34	3.504	-8.455	2.886	-12.5397
920	2100.0	9.762	12.939	11.279	12.260	8.859	14.18	164.53	3.099	-8.509	2.517	-12.5991
940	2100.0	9.643	12.879	11.175	12.245	8.856	13.97	167.91	2.748	-8.561	2.199	-12.6578
960	2100.0	9.525	12.820	11.071	12.230	8.852	13.75	171.49	2.442	-8.612	1.924	-12.7158
980	2100.0	9.408	12.761	10.969	12.215	8.848	13.53	175.31	2.176	-8.662	1.686	-12.7731
1000	2100.0	9.291	12.703	10.866	12.201	8.845	13.29	179.37	1.944	-8.711	1.480	-12.8297

BLANK PAGE

Part 6.2

120 km to 1000 km

Summer Models

TEMPERATURE, PRESSURE, DENSITY, SCALE HEIGHT, MOLECULAR WEIGHT, AND NUMBER DENSITIES

Metric Units

SUMMER MODEL, EXOSPHERIC TEMPERATURE = 600° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
120	380.0	16.763	16.810	17.500	13.503		26.77	12.49	2.303 - 5	-4.638	1.952 - 8	-7.7096
125	413.0	16.528	16.674	17.290	13.455		26.44	13.77	1.574	-4.803	1.212	-7.9165
130	441.2	16.315	16.554	17.100	13.415		26.10	14.92	1.111	-4.954	7.905 - 9	-8.1021
135	464.2	16.119	16.445	16.926	13.379		25.76	15.93	8.034 - 6	-5.095	5.362	-8.2707
140	483.9	15.936	16.344	16.763	13.347		25.40	16.87	5.923	-5.227	3.740	-8.4271
145	499.8	15.762	16.250	16.610	13.319		25.04	17.70	4.436	-5.353	2.673	-8.5730
150	513.6	15.596	16.161	16.462	13.292		24.67	18.50	3.365	-5.473	1.944	-8.7113
155	525.1	15.436	16.076	16.321	13.267		24.28	19.24	2.582 - 6	-5.588	1.436 - 9	-8.8428
160	535.0	15.281	15.995	16.184	13.244		23.90	19.95	2.000	-5.699	1.075	-8.9687
165	543.2	15.130	15.916	16.051	13.222		23.50	20.63	1.563	-5.806	8.136 -10	-9.0896
170	550.2	14.982	15.839	15.921	13.200		23.11	21.28	1.232	-5.910	6.221	-9.2061
175	556.2	14.837	15.764	15.793	13.180		22.71	21.92	9.771 - 7	-6.010	4.799	-9.3189
180	561.1	14.694	15.691	15.668	13.160		22.32	22.54	7.803	-6.108	3.733	-9.4280
185	564.8	14.554	15.619	15.545	13.141		21.92	23.13	6.269	-6.203	2.927	-9.5336
190	568.2	14.415	15.548	15.423	13.123		21.54	23.73	5.064	-6.296	2.309	-9.6367
195	570.2	14.277	15.479	15.302	13.105		21.16	24.27	4.111	-6.386	1.835	-9.7364
200	574.1	14.140	15.409	15.181	13.086		20.79	24.91	3.355	-6.474	1.461	-9.8354
205	577.5	14.003	15.339	15.062	13.068		20.43	25.54	2.752 - 7	-6.560	1.171 -10	-9.9315
210	580.5	13.869	15.271	14.943	13.050		20.08	26.15	2.268	-6.644	9.437 -11	-10.0252
215	583.0	13.735	15.203	14.826	13.032		19.75	26.75	1.877	-6.726	7.649	-10.1164
220	585.3	13.602	15.136	14.709	13.015		19.44	27.33	1.560	-6.807	6.232	-10.2054
225	587.2	13.470	15.069	14.594	12.997		19.13	27.89	1.302	-6.885	5.102	-10.2922
230	588.9	13.339	15.003	14.479	12.980		18.85	28.44	1.090	-6.963	4.196	-10.3771
235	590.3	13.208	14.937	14.365	12.963		18.58	28.97	9.158 - 8	-7.038	3.466	-10.4601
240	591.6	13.079	14.872	14.251	12.947		18.32	29.48	7.718	-7.112	2.875	-10.5414
245	592.7	12.949	14.807	14.138	12.930		18.08	29.98	6.524	-7.186	2.393	-10.6210
250	593.7	12.821	14.742	14.025	12.914		17.85	30.46	5.529	-7.257	1.999	-10.6991
255	594.5	12.692	14.677	13.912	12.897		17.63	30.92	4.698 - 8	-7.328	1.676 -11	-10.7757
260	595.2	12.565	14.613	13.800	12.881		17.43	31.37	4.001	-7.398	1.409	-10.8511
265	595.8	12.437	14.549	13.689	12.865		17.23	31.81	3.415	-7.467	1.188	-10.9251
270	596.4	12.310	14.486	13.578	12.849		17.05	32.23	2.922	-7.534	1.005	-10.9980
275	596.9	12.184	14.422	13.467	12.833		16.87	32.64	2.504	-7.601	8.514 -12	-11.0699
280	597.3	12.057	14.359	13.356	12.817		16.70	33.05	2.151	-7.667	7.233	-11.1407
285	597.6	11.931	14.296	13.246	12.801		16.54	33.45	1.850	-7.733	6.158	-11.2106
290	597.9	11.806	14.233	13.136	12.785		16.37	33.85	1.595	-7.797	5.253	-11.2796
295	598.2	11.680	14.170	13.026	12.769		16.22	34.25	1.377	-7.861	4.490	-11.3478
300	598.4	11.555	14.107	12.916	12.754		16.06	34.65	1.191	-7.924	3.844	-11.4152
310	598.8	11.305	13.982	12.698	12.722		15.74	35.47	8.954 - 9	-8.048	2.831 -12	-11.5480
320	599.1	11.057	13.858	12.480	12.691		15.41	36.35	6.778	-8.169	2.097	-11.6783
330	599.3	10.809	13.734	12.263	12.660		15.06	37.33	5.166	-8.287	1.562	-11.8064
340	599.5	10.562	13.610	12.047	12.629		14.68	38.43	3.967	-8.402	1.168	-11.9324
350	599.6	10.316	13.487	11.832	12.598		14.25	39.70	3.071	-8.513	8.779 -13	-12.0566
360	599.7	10.071	13.365	11.617	12.568		13.78	41.21	2.398	-8.620	6.625	-12.1788
370	599.8	9.826	13.242	11.403	12.537		13.24	43.00	1.891	-8.723	5.020	-12.2993
380	599.8	9.583	13.121	11.189	12.506		12.65	45.16	1.507	-8.822	3.821	-12.4178
390	599.9	9.340	12.999	10.977	12.476		12.00	47.75	1.215	-8.916	2.922	-12.5344
400	599.9	9.097	12.878	10.765	12.446		11.30	50.87	9.913 -10	-9.004	2.245	-12.6487

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
410	599.9	8.856	12.757	10.553	12.416		10.55	54.61	8.199 -10	-9.086	1.735 -13	-12.7608
420	599.9	8.615	12.637	10.343	12.385		9.78	59.08	6.874	-9.163	1.348	-12.8702
430	600.0	8.375	12.517	10.132	12.355		9.01	64.38	5.844	-9.233	1.055	-12.9767
440	600.0	8.136	12.397	9.923	12.325		8.24	70.60	5.038	-9.298	8.319 -14	-13.0799
450	600.0	7.897	12.278	9.714	12.296		7.50	77.81	4.402	-9.356	6.614	-13.1795
460	600.0	7.659	12.159	9.506	12.266		6.80	86.07	3.895	-9.409	5.307	-13.2751
470	600.0	7.422	12.040	9.298	12.236		6.15	95.37	3.488	-9.457	4.301	-13.3664
480	600.0	7.186	11.922	9.091	12.207		5.57	105.69	3.157	-9.501	3.523	-13.4530
490	600.0	6.950	11.804	8.884	12.177		5.05	116.93	2.886	-9.540	2.919	-13.5347
500	600.0	6.715	11.686	8.679	12.148	12.121	4.59	128.94	2.660	-9.575	2.447	-13.6113
510	600.0	6.480	11.569	8.473	12.118	12.113	4.19	141.53	2.470 -10	-9.607	2.077 -14	-13.6826
520	600.0	6.246	11.452	8.269	12.089	12.106	3.85	154.50	2.309	-9.637	1.783	-13.7488
530	600.0	6.013	11.336	8.065	12.060	12.098	3.56	167.62	2.169	-9.664	1.549	-13.8099
540	600.0	5.781	11.220	7.861	12.031	12.091	3.31	180.68	2.048	-9.689	1.361	-13.8662
550	600.0	5.549	11.104	7.658	12.002	12.084	3.10	193.50	1.942	-9.712	1.208	-13.9179
560	600.0	5.318	10.988	7.456	11.973	12.077	2.92	205.93	1.847	-9.734	1.083	-13.9655
570	600.0	5.088	10.873	7.254	11.944	12.069	2.77	217.87	1.762	-9.754	9.791 -15	-14.0092
580	600.0	4.858	10.758	7.053	11.915	12.062	2.64	229.26	1.685	-9.773	8.923	-14.0495
590	600.0	4.629	10.644	6.853	11.887	12.055	2.53	240.08	1.614	-9.792	8.189	-14.0868
600	600.0	4.400	10.529	6.653	11.858	12.048	2.43	250.34	1.550	-9.810	7.561	-14.1214
610	600.0	4.173	10.415	6.453	11.830	12.040	2.35	260.07	1.490 -10	-9.827	7.019 -15	-14.1537
620	600.0	3.945	10.302	6.254	11.801	12.033	2.28	269.31	1.435	-9.843	6.545	-14.1841
630	600.0	3.719	10.189	6.056	11.773	12.026	2.22	278.12	1.384	-9.859	6.128	-14.2127
640	600.0	3.493	10.076	5.858	11.745	12.019	2.15	286.56	1.335	-9.874	5.757	-14.2398
650	600.0	3.268	9.963	5.661	11.717	12.012	2.10	294.67	1.290	-9.889	5.425	-14.2656
660	600.0	3.043	9.851	5.465	11.688	12.005	2.05	302.52	1.248	-9.904	5.125	-14.2903
670	600.0	2.820	9.739	5.269	11.660	11.998	2.00	310.14	1.208	-9.918	4.852	-14.3141
680	600.0	2.596	9.627	5.073	11.633	11.991	1.96	317.57	1.170	-9.932	4.603	-14.3370
690	600.0	2.374	9.516	4.878	11.605	11.984	1.92	324.86	1.134	-9.945	4.374	-14.3591
700	600.0	2.152	9.405	4.684	11.577	11.977	1.89	332.04	1.100	-9.959	4.163	-14.3806
710	600.0	1.930	9.294	4.490	11.549	11.970	1.85	339.12	1.068 -10	-9.972	3.968 -15	-14.4015
720	600.0	1.710	9.184	4.297	11.522	11.963	1.82	346.14	1.037	-9.984	3.786	-14.4218
730	600.0	1.489	9.074	4.104	11.494	11.956	1.79	353.10	1.008	-9.997	3.617	-14.4416
740	600.0	1.270	8.964	3.912	11.467	11.949	1.76	360.03	9.799 -11	-10.009	3.459	-14.4610
750	600.0	1.051	8.855	3.720	11.439	11.942	1.73	366.92	9.533	-10.021	3.311	-14.4800
760	600.0	0.833	8.746	3.529	11.412	11.935	1.71	373.80	9.279	-10.033	3.173	-14.4986
770	600.0	0.615	8.637	3.339	11.385	11.928	1.68	380.65	9.036	-10.044	3.043	-14.5168
780	600.0	0.398	8.528	3.149	11.358	11.922	1.65	387.50	8.804	-10.055	2.920	-14.5346
790	600.0	0.182	8.420	2.959	11.331	11.915	1.63	394.33	8.581	-10.066	2.805	-14.5521
800	600.0	-0.034	8.312	2.770	11.304	11.908	1.61	401.15	8.368	-10.077	2.696	-14.5692
820	600.0	-0.464	8.097	2.394	11.250	11.894	1.56	414.77	7.968 -11	-10.099	2.497 -15	-14.6026
840	600.0	-0.891	7.883	2.020	11.196	11.881	1.52	428.32	7.599	-10.119	2.319	-14.6347
860	600.0	-1.319	7.669	1.648	11.142	11.854	1.45	455.15	6.941	-10.159	2.015	-14.6956
900	600.0	-2.160	7.249	0.910	11.038	11.841	1.42	488.37	6.647	-10.177	1.886	-14.7245
920	600.0	-2.578	7.040	0.544	10.985	11.928	1.38	481.42	6.372	-10.196	1.769	-14.7523
940	600.0	-2.994	6.832	0.180	10.933	11.815	1.36	494.27	6.116	-10.213	1.663	-14.7792
960	600.0	-3.407	6.626	-0.182	10.882	11.802	1.33	506.90	5.877	-10.231	1.566	-14.8051
980	600.0	-3.818	6.420	-0.542	10.830	11.789	1.30	519.27	5.652	-10.248	1.479	-14.8302
1000	600.0	-4.227	6.215	-0.901	10.779	11.776	1.28	531.38	5.441	-10.264	1.399	-14.8543

SUMMER MODEL, EXOSPHERE TEMPERATURE = 700° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_s, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
120	380.6	16.762	16.809	17.499	13.502		26.77	12.51	2.302 - 5	-4.638	1.947 - 8	-7.7106
125	429.1	16.515	16.660	17.277	13.446		26.45	14.30	1.585	-4.800	1.175	-7.9299
130	470.7	16.300	16.532	17.083	13.399		26.13	15.90	1.138	-4.944	7.601 - 9	-8.1191
135	504.8	16.109	16.421	.917	13.360		25.81	17.29	8.424 - 6	-5.074	5.181	-8.2856
140	534.1	15.933	16.321	.755	13.326		25.49	18.56	6.374	-5.196	3.659	-8.4366
145	558.0	15.770	16.230	.611	13.296		25.17	19.66	4.907	-5.309	2.662	-8.5748
150	578.5	15.617	16.146	16.474	13.269		24.84	20.69	3.830	-5.417	1.978	-8.7037
155	595.6	15.471	16.067	16.345	13.245		24.51	21.62	3.024 - 6	-5.519	1.497 - 9	-8.8248
160	610.2	15.331	15.991	16.221	13.222		24.18	22.49	2.410	-5.618	1.149	-8.9397
165	622.8	15.197	15.920	16.102	13.201		23.85	23.28	1.937	-5.713	8.933 -10	-9.0490
170	632.3	15.065	15.851	15.987	13.181		23.51	24.04	1.568	-5.805	7.013	-9.1541
175	641.0	14.938	15.784	15.874	13.162		23.17	24.77	1.278	-5.894	5.555	-9.2553
180	648.3	14.812	15.719	15.764	13.144		22.83	25.46	1.047	-5.980	4.435	-9.3531
185	654.1	14.690	15.655	15.656	13.127		22.49	26.11	8.625 - 7	-6.064	3.567	-9.4476
190	659.0	14.569	15.593	15.549	13.110		22.16	26.75	7.139	-6.146	2.887	-9.5396
195	662.0	14.450	15.533	15.445	13.094		21.83	27.32	5.933	-6.227	2.353	-9.6284
200	665.7	14.331	15.472	15.341	13.078		21.50	27.93	4.951	-6.305	1.923	-9.7160
205	670.3	14.213	15.412	15.237	13.062		21.18	28.60	4.148 - 7	-6.382	1.576 -10	-9.8024
210	674.3	14.096	15.352	15.134	13.046		20.86	29.24	3.490	-6.457	1.299	-9.8865
215	677.7	13.980	15.293	15.033	13.030		20.56	29.88	2.947	-6.531	1.075	-9.9686
220	680.7	13.866	15.235	14.932	13.015		20.26	30.49	2.497	-6.603	8.937 -11	-10.0488
225	683.3	13.752	15.177	14.832	13.000		19.97	31.09	2.123	-6.673	7.462	-10.1271
230	685.5	13.639	15.120	14.733	12.985		19.70	31.68	1.810	-6.742	6.255	-10.2038
235	687.5	13.526	15.063	14.635	12.970		19.43	32.25	1.548	-6.810	5.262	-10.2788
240	689.2	13.415	15.007	14.537	12.956		19.18	32.81	1.327	-6.877	4.443	-10.3523
245	690.6	13.304	14.951	14.439	12.942		18.93	33.35	1.141	-6.943	3.763	-10.4244
250	691.9	13.193	14.895	14.342	12.927		18.70	33.88	9.835 - 8	-7.007	3.198	-10.4952
255	693.0	13.083	14.840	14.246	12.913		18.48	34.39	8.495 - 8	-7.071	2.725 -11	-10.5646
260	693.9	12.973	14.784	14.150	12.899		18.27	34.89	7.354	-7.133	2.329	-10.6329
265	694.7	12.864	14.729	14.054	12.885		18.07	35.37	6.378	-7.195	1.995	-10.7000
270	695.4	12.755	14.675	13.958	12.871		17.88	35.84	5.542	-7.256	1.714	-10.7660
275	696.1	12.646	14.620	13.863	12.858		17.70	36.29	4.825	-7.317	1.476	-10.8310
280	696.6	12.538	14.566	13.768	12.844		17.53	36.73	4.207	-7.376	1.273	-10.8951
285	697.0	12.429	14.512	13.674	12.830		17.36	37.15	3.675	-7.435	1.101	-10.9582
290	697.4	12.322	14.458	13.579	12.817		17.21	37.57	3.215	-7.493	9.539 -12	-11.0205
295	697.8	12.214	14.404	13.485	12.803		17.06	37.97	2.816	-7.550	8.280	-11.0820
300	698.1	12.107	14.350	13.391	12.790		16.92	38.37	2.470	-7.607	7.200	-11.1427
310	698.6	11.893	14.243	13.204	12.763		16.65	39.14	1.908 - 8	-7.719	5.470 -12	-11.2620
320	698.9	11.679	14.136	13.017	12.736		16.39	39.88	1.482	-7.829	4.180	-11.3789
330	699.2	11.467	14.030	12.831	12.709		16.15	40.62	1.156	-7.937	3.210	-11.4934
340	699.4	11.255	13.924	12.646	12.683		15.91	41.37	9.056 - 9	-8.043	2.477	-11.6060
350	699.5	11.045	13.818	12.461	12.656		15.67	42.14	7.127	-8.147	1.920	-11.7168
360	699.7	10.834	13.713	12.277	12.630		15.42	42.96	5.634	-8.249	1.493	-11.8259
370	699.7	10.625	13.608	12.094	12.604		15.16	43.84	4.474	-8.349	1.166	-11.9335
380	699.8	10.416	13.504	11.911	12.578		14.87	44.80	3.570	-8.447	9.128 -13	-12.0396
390	699.9	10.208	13.400	11.728	12.551		14.57	45.87	2.864	-8.543	7.170	-12.1445
400	699.9	10.000	13.296	11.547	12.526		14.24	47.08	2.309	-8.637	5.650	-12.2479

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
410	699.9	9.793	13.192	11.365	12.500		13.88	48.46	1.873 - 9	-8.728	4.466 -13	-12.3501
420	699.9	9.587	13.089	11.185	12.474		13.48	50.03	1.528	-8.816	3.540	-12.4509
430	700.0	9.381	12.986	11.005	12.448		13.05	51.84	1.256	-8.901	2.816	-12.5504
440	700.0	9.176	12.884	10.825	12.422		12.58	53.92	1.039	-8.983	2.247	-12.6484
450	700.0	8.971	12.782	10.646	12.397		12.08	56.32	8.668 -10	-9.062	1.800	-12.7448
460	700.0	8.767	12.680	10.467	12.371		11.55	59.07	7.288	-9.137	1.447	-12.8396
470	700.0	8.564	12.578	10.289	12.346		11.00	62.22	6.179	-9.209	1.168	-12.9326
480	700.0	8.361	12.477	10.112	12.320		10.43	65.81	5.285	-9.277	9.472 -14	-13.0236
490	700.0	8.159	12.375	9.935	12.295		9.85	69.88	4.560	-9.341	7.719	-13.1124
500	700.0	7.957	12.275	9.758	12.270	11.553	9.27	74.46	3.969	-9.401	6.325	-13.1990
510	700.0	7.756	12.174	9.582	12.245	11.547	8.70	79.57	3.486 -10	-9.458	5.212 -14	-13.2830
520	700.0	7.556	12.074	9.407	12.220	11.541	8.15	85.22	3.087	-9.510	4.323	-13.3643
530	700.0	7.356	11.974	9.232	12.195	11.534	7.62	91.41	2.756	-9.560	3.609	-13.4426
540	700.0	7.157	11.875	9.058	12.170	11.528	7.12	98.10	2.480	-9.606	3.034	-13.5179
550	700.0	6.958	11.775	8.884	12.145	11.522	6.66	105.26	2.247	-9.648	2.570	-13.5900
560	700.0	6.760	11.676	8.710	12.120	11.516	6.23	112.82	2.050	-9.688	2.194	-13.6587
570	700.0	6.563	11.577	8.538	12.096	11.509	5.84	120.71	1.882	-9.725	1.888	-13.7241
580	700.0	6.366	11.479	8.365	12.071	11.503	5.49	128.83	1.737	-9.760	1.637	-13.7859
590	700.0	6.170	11.381	8.193	12.046	11.497	5.17	137.09	1.611	-9.793	1.431	-13.8443
600	700.0	5.974	11.283	8.022	12.022	11.491	4.89	145.39	1.501	-9.824	1.261	-13.8994
610	700.0	5.779	11.185	7.851	11.997	11.485	4.64	153.64	1.404 -10	-9.853	1.119 -14	-13.9511
620	700.0	5.584	11.088	7.681	11.973	11.479	4.42	161.75	1.318	-9.880	1.001	-13.9998
630	700.0	5.390	10.991	7.511	11.949	11.472	4.23	169.65	1.240	-9.906	9.006 -15	-14.0455
640	700.0	5.196	10.894	7.341	11.925	11.466	4.06	177.29	1.171	-9.931	8.159	-14.0884
650	700.0	5.003	10.798	7.172	11.900	11.460	3.91	184.62	1.108	-9.955	7.435	-14.1287
660	700.0	4.811	10.701	7.004	11.876	11.454	3.77	191.62	1.051	-9.979	6.812	-14.1667
670	700.0	4.619	10.605	6.836	11.852	11.448	3.66	198.29	9.980 -11	-10.001	6.272	-14.2026
680	700.0	4.428	10.510	6.668	11.828	11.442	3.55	204.62	9.497	-10.022	5.800	-14.2366
690	700.0	4.237	10.414	6.501	11.805	11.436	3.46	210.64	9.051	-10.043	5.384	-14.2689
700	700.0	4.046	10.319	6.334	11.781	11.430	3.38	216.36	8.636	-10.064	5.016	-14.2996
710	700.0	3.857	10.224	6.168	11.757	11.424	3.31	221.80	8.251 -11	-10.083	4.688 -15	-14.3290
720	700.0	3.667	10.130	6.003	11.733	11.418	3.24	227.01	7.891	-10.103	4.393	-14.3572
730	700.0	3.479	10.035	5.838	11.710	11.412	3.18	231.99	7.555	-10.122	4.127	-14.3843
740	700.0	3.291	9.941	5.673	11.686	11.406	3.12	236.80	7.239	-10.140	3.886	-14.4105
750	700.0	3.103	9.847	5.509	11.663	11.400	3.07	241.45	6.943	-10.158	3.665	-14.4359
760	700.0	2.916	9.754	5.345	11.639	11.395	3.02	245.97	6.664	-10.176	3.463	-14.4606
770	700.0	2.729	9.661	5.182	11.616	11.389	2.98	250.39	6.401	-10.194	3.276	-14.4846
780	700.0	2.543	9.568	5.019	11.593	11.383	2.94	254.73	6.152	-10.211	3.104	-14.5080
790	700.0	2.358	9.475	4.856	11.570	11.377	2.90	259.01	5.917	-10.228	2.945	-14.5310
800	700.0	2.173	9.382	4.694	11.546	11.371	2.86	263.26	5.695	-10.245	2.796	-14.5534
820	700.0	1.804	9.198	4.372	11.500	11.360	2.78	271.70	5.285 -11	-10.277	2.528 -15	-14.5972
840	700.0	1.438	9.015	4.051	11.455	11.348	2.72	280.18	4.915	-10.308	2.293	-14.6396
860	700.0	0.711	8.652	3.415	11.364	11.325	2.59	297.51	4.279	-10.369	1.901	-14.7210
900	700.0	0.351	8.471	3.099	11.319	11.314	2.52	306.52	4.005	-10.397	1.736	-14.7604
920	700.0	-0.007	8.292	2.786	11.274	11.302	2.46	315.79	3.756	-10.425	1.589	-14.7988
940	700.0	-0.364	8.114	2.474	11.229	11.291	2.40	325.37	3.528	-10.452	1.457	-14.8365
960	700.0	-0.718	7.937	2.163	11.185	11.280	2.35	335.26	3.321	-10.479	1.338	-14.8735
980	700.0	-1.071	7.761	1.855	11.141	11.269	2.29	345.48	3.132	-10.504	1.231	-14.9096
1000	700.0	-1.421	7.585	1.548	11.097	11.258	2.23	356.04	2.958	-10.529	1.135	-14.9451

SUMMER MODEL, EXOSPHERIC TEMPERATURE = 800° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
120	380.1	16.761	16.809	17.498	13.502		26.77	12.50	2.294 - 5	-4.639	1.943 - 8	-7.7116
125	443.8	16.502	16.646	17.263	13.437		26.45	14.79	1.589	-4.799	1.139	-7.9433
130	498.7	16.284	16.511	17.067	13.384		26.12	16.84	1.159	-4.936	7.306 - 9	-8.1353
135	544.3	16.096	16.398	16.897	13.342		25.85	18.62	8.739 - 6	-5.059	4.992	-8.3017
140	583.5	15.936	16.298	16.745	13.306		25.56	20.22	6.755	-5.170	3.559	-8.4486
145	615.7	15.772	16.210	16.607	13.275		25.27	21.61	5.319	-5.274	2.626	-8.5807
150	643.4	15.629	16.128	16.479	13.248		24.98	22.88	4.249	-5.372	1.984	-8.7024
155	666.1	15.494	16.054	16.359	13.223		24.69	24.00	3.433 - 6	-5.464	1.531 - 9	-8.8151
160	685.6	15.366	15.983	16.246	13.201		24.40	25.03	2.799	-5.553	1.198	-8.9214
165	701.7	15.244	15.917	16.137	13.181		24.11	25.97	2.301	-5.638	9.510 -10	-9.0218
170	715.6	15.126	15.854	16.033	13.162		23.83	26.85	1.904	-5.720	7.624	-9.1178
175	727.2	15.011	15.793	15.932	13.144		23.53	27.67	1.585	-5.800	6.168	-9.2098
180	737.0	14.899	15.734	15.833	13.127		23.23	28.44	1.326	-5.877	5.029	-9.2985
185	744.9	14.790	15.677	15.737	13.111		22.93	29.15	1.115	-5.953	4.130	-9.3840
190	751.5	14.683	15.622	15.643	13.096		22.65	29.84	9.411 - 7	-6.026	3.411	-9.4671
195	757.1	14.578	15.567	15.550	13.081		22.36	30.50	7.974	-6.098	2.832	-9.5479
200	761.5	14.473	15.514	15.458	13.067		22.07	31.13	6.780	-6.169	2.363	-9.6265
205	765.0	14.371	15.462	15.368	13.053		21.78	31.73	5.783 - 7	-6.238	1.980 -10	-9.7033
210	767.6	14.269	15.410	15.279	13.040		21.50	32.30	4.946	-6.306	1.666	-9.7783
215	772.0	14.167	15.358	15.189	13.026		21.22	32.97	4.244	-6.372	1.403	-9.8530
220	775.8	14.066	15.306	15.100	13.012		20.95	33.61	3.652	-6.437	1.186	-9.9259
225	779.0	13.965	15.255	15.012	12.998		20.68	34.24	3.151	-6.501	1.006	-9.9973
230	781.9	13.866	15.205	14.925	12.985		20.42	34.86	2.727	-6.564	8.565 -11	-10.0673
235	784.3	13.767	15.154	14.838	12.972		20.17	35.46	2.365	-6.626	7.314	-10.1358
240	786.5	13.669	15.105	14.752	12.959		19.92	36.05	2.057	-6.687	6.265	-10.2031
245	788.3	13.571	15.056	14.667	12.947		19.68	36.62	1.792	-6.747	5.382	-10.2690
250	789.9	13.474	15.007	14.582	12.934		19.45	37.19	1.565	-6.805	4.636	-10.3339
255	791.2	13.378	14.958	14.497	12.922		19.23	37.74	1.370 - 7	-6.863	4.004 -11	-10.3975
260	792.4	13.281	14.909	14.413	12.909		19.02	38.28	1.201	-6.921	3.466	-10.4602
265	793.5	13.186	14.861	14.329	12.897		18.81	38.80	1.055	-6.977	3.008	-10.5218
270	794.3	13.090	14.813	14.245	12.885		18.62	39.32	9.280 - 8	-7.032	2.616	-10.5824
275	795.1	12.995	14.765	14.161	12.873		18.43	39.82	8.178	-7.087	2.280	-10.6421
280	795.8	12.900	14.718	14.078	12.861		18.25	40.31	7.219	-7.142	1.991	-10.7010
285	796.3	12.805	14.670	13.995	12.849		18.07	40.78	6.381	-7.195	1.742	-10.7590
290	796.8	12.711	14.623	13.913	12.837		17.91	41.25	5.649	-7.248	1.527	-10.8162
295	797.3	12.616	14.576	13.830	12.825		17.75	41.70	5.007	-7.300	1.341	-10.8726
300	797.6	12.522	14.528	13.748	12.813		17.60	42.14	4.444	-7.352	1.179	-10.9284
310	798.2	12.335	14.435	13.584	12.789		17.31	42.99	3.514 - 8	-7.454	9.167 -12	-11.0378
320	798.7	12.148	14.341	13.420	12.766		17.05	43.81	2.791	-7.554	7.167	-11.1447
330	799.0	11.963	14.248	13.258	12.743		16.81	44.59	2.226	-7.653	5.632	-11.2493
340	799.3	11.777	14.156	13.095	12.719		16.58	45.35	1.782	-7.749	4.447	-11.3520
350	799.4	11.593	14.063	12.934	12.696		16.37	46.10	1.432	-7.844	3.526	-11.4527
360	799.6	11.409	13.971	12.773	12.673		16.16	46.84	1.155	-7.938	2.807	-11.5518
370	799.7	11.225	13.879	12.612	12.650		15.95	47.59	9.344 - 9	-8.029	2.242	-11.6494
380	799.8	11.043	13.788	12.452	12.627		15.75	48.36	7.586	-8.120	1.796	-11.7456
390	799.9	10.860	13.697	12.293	12.604		15.54	49.16	6.179	-8.209	1.444	-11.8405
400	799.9	10.679	13.606	12.134	12.582		15.33	50.00	5.050	-8.297	1.164	-11.9341

Altitude Z, km	Temp. T, °K	Number density: log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$	Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
410	799.9	10.498	13.515	11.975	12.559		15.10	50.89	4.142 - 9	-8.383	9.404 -13	-12.0267
420	799.9	10.317	13.425	11.817	12.536		14.86	51.87	3.409	-8.467	7.618	-12.1182
430	799.9	10.137	13.335	11.659	12.514		14.61	52.93	2.817	-8.550	6.186	-12.2086
440	800.0	9.957	13.245	11.502	12.491		14.33	54.10	2.337	-8.631	5.035	-12.2980
450	800.0	9.778	13.156	11.346	12.469		14.04	55.40	1.946	-8.711	4.108	-12.3864
460	800.0	9.600	13.067	11.189	12.447		13.72	56.85	1.629	-8.788	3.359	-12.4737
470	800.0	9.422	12.978	11.034	12.424		13.38	58.48	1.369	-8.863	2.754	-12.5600
480	800.0	9.245	12.889	10.878	12.402		13.01	60.30	1.157	-8.937	2.263	-12.6452
490	800.0	9.068	12.801	10.723	12.380		12.62	62.34	9.829 -10	-9.008	1.865	-12.7293
500	800.0	8.892	12.712	10.569	12.358	11.102	12.21	64.63	8.396	-9.076	1.541	-12.8121
510	800.0	8.716	12.624	10.415	12.336	11.096	11.78	67.19	7.213 -10	-9.142	1.277 -13	-12.8937
520	800.0	8.540	12.537	10.262	12.314	11.091	11.33	70.05	6.235	-9.205	1.062	-12.9738
530	800.0	8.366	12.449	10.109	12.292	11.085	10.87	73.24	5.422	-9.266	8.860 -14	-13.0525
540	800.0	8.191	12.362	9.956	12.271	11.080	10.40	76.77	4.745	-9.324	7.419	-13.1297
550	800.0	8.017	12.275	9.804	12.249	11.074	9.93	80.66	4.178	-9.379	6.236	-13.2051
560	800.0	7.844	12.189	9.652	12.227	11.069	9.46	84.93	3.703	-9.431	5.264	-13.2787
570	800.0	7.671	12.102	9.501	12.205	11.063	8.99	89.57	3.302	-9.481	4.463	-13.3504
580	800.0	7.499	12.016	9.350	12.184	11.058	8.54	94.60	2.962	-9.528	3.802	-13.4200
590	800.0	7.327	11.930	9.199	12.162	11.053	8.10	99.99	2.672	-9.573	3.254	-13.4875
600	800.0	7.156	11.845	9.049	12.141	11.047	7.68	105.73	2.424	-9.615	2.801	-13.5527
610	800.0	6.985	11.759	8.900	12.120	11.042	7.29	111.78	2.211 -10	-9.655	2.423 -14	-13.6156
620	800.0	6.815	11.674	8.751	12.098	11.036	6.92	118.10	2.027	-9.693	2.108	-13.6761
630	800.0	6.645	11.589	8.602	12.077	11.031	6.57	124.65	1.867	-9.729	1.845	-13.7341
640	800.0	6.475	11.504	8.454	12.056	11.026	6.26	131.37	1.726	-9.763	1.624	-13.7895
650	800.0	6.307	11.420	8.306	12.035	11.020	5.96	138.19	1.603	-9.795	1.437	-13.8425
660	800.0	6.138	11.336	8.159	12.014	11.015	5.70	145.05	1.494	-9.826	1.279	-13.8930
670	800.0	5.970	11.252	8.012	11.993	11.010	5.46	151.89	1.396	-9.855	1.145	-13.9410
680	800.0	5.803	11.168	7.865	11.972	11.005-	5.24	158.64	1.309	-9.883	1.031	-13.9867
690	800.0	5.636	11.085	7.719	11.951	10.999	5.04	165.27	1.231	-9.910	9.332 -15	-14.0300
700	800.0	5.469	11.001	7.573	11.930	10.994	4.87	171.71	1.160	-9.936	8.489	-14.0712
710	800.0	5.303	10.918	7.428	11.909	10.989	4.71	177.93	1.095 -10	-9.960	7.758 -15	-14.1102
720	800.0	5.138	10.836	7.283	11.889	10.984	4.57	183.90	1.036	-9.984	7.123	-14.1473
730	800.0	4.973	10.753	7.138	11.868	10.978	4.45	189.59	9.824 -11	-10.008	6.567	-14.1826
740	800.0	4.808	10.671	6.994	11.847	10.973	4.33	195.01	9.327	-10.030	6.078	-14.2162
750	800.0	4.644	10.589	6.850	11.827	10.968	4.24	200.14	8.866	-10.052	5.646	-14.2482
760	800.0	4.480	10.507	6.707	11.806	10.963	4.15	204.99	8.439	-10.074	5.262	-14.2789
770	800.0	4.317	10.425	6.564	11.786	10.958	4.07	209.57	8.042	-10.095	4.918	-14.3082
780	800.0	4.154	10.344	6.422	11.766	10.953	4.00	213.88	7.671	-10.115	4.610	-14.3363
790	800.0	3.992	10.263	6.280	11.745	10.948	3.93	217.95	7.324	-10.135	4.331	-14.3634
800	800.0	3.830	10.182	6.138	11.725	10.942	3.88	221.78	6.998	-10.155	4.078	-14.3895
820	800.0	3.508	10.020	5.856	11.685	10.932	3.78	228.86	6.404 -11	-10.194	3.637 -15	-14.4393
840	800.0	3.187	9.860	5.575	11.645	10.922	3.70	235.25	5.875	-10.231	3.264	-14.4862
860	800.0	2.551	9.542	5.018	11.565	10.902	3.56	246.58	4.977	-10.303	2.667	-14.5739
900	800.0	2.236	9.385	4.742	11.526	10.892	3.51	251.77	4.593	-10.338	2.424	-14.6154
920	800.0	1.922	9.228	4.468	11.486	10.882	3.46	256.79	4.245	-10.372	2.209	-14.6558
940	800.0	1.610	9.072	4.195	11.447	10.873	3.41	261.70	3.930	-10.406	2.018	-14.6951
960	800.0	1.300	8.917	3.923	11.409	10.863	3.37	266.57	3.644	-10.438	1.847	-14.7336
980	800.0	0.992	8.763	3.653	11.370	10.853	3.33	271.46	3.382	-10.471	1.693	-14.7715
1000	800.0	0.685	8.609	3.385	11.332	10.843	3.29	276.42	3.144	-10.502	1.554	-14.8087

SUMMER MODEL. EXOSPHERIC TEMPERATURE = 900° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
120	377.6	16.360	16.809	17.495	13.503		26.76	12.48	2.287 - 5	-4.641	1.939 - 8	-7.7123
125	457.3	16.490	16.631	17.252	13.429		26.45	15.24	1.593	-4.798	1.109	-7.9552
130	524.8	16.270	16.494	17.051	13.372		26.16	17.71	1.176	-4.930	7.052 - 9	-8.1517
135	581.4	16.084	16.378	16.882	13.326		25.88	19.86	9.014 - 6	-5.045	4.827	-8.3163
140	630.1	15.919	16.278	16.734	13.289		25.62	21.78	7.090	-5.149	3.467	-8.4601
145	670.4	15.772	16.191	16.602	13.257		25.35	23.45	5.684	-5.245	2.586	-8.5874
150	705.1	15.636	16.114	16.480	13.220		25.09	24.96	4.624	-5.335	1.979	-8.7035
155	733.6	15.513	16.041	16.368	13.205		24.83	26.28	3.804 - 6	-5.420	1.549 - 9	-8.8100
160	758.2	15.391	15.974	16.262	13.184		24.58	27.49	3.159	-5.500	1.232	-8.9096
165	778.7	15.278	15.912	16.162	13.163		24.32	28.58	2.643	-5.578	9.927 -10	-9.0032
170	796.4	15.170	15.853	16.065	13.144		24.06	29.59	2.226	-5.653	8.087	-9.0922
175	810.9	15.065	15.797	15.973	13.128		23.80	30.50	1.884	-5.725	6.652	-9.1770
180	823.3	14.964	15.743	15.883	13.112		23.54	31.35	1.603	-5.795	5.514	-9.2586
185	833.7	14.865	15.690	15.796	13.096		23.28	32.15	1.370	-5.863	4.601	-9.3372
190	842.5	14.768	15.640	15.711	13.082		23.03	32.90	1.174	-5.930	3.861	-9.4134
195	849.7	14.673	15.590	15.627	13.068		22.77	33.61	1.011	-5.995	3.257	-9.4872
200	855.7	14.580	15.542	15.547	13.055		22.51	34.29	8.721 - 7	-6.059	2.760	-9.5592
205	860.7	14.488	15.495	15.464	13.042		22.26	34.94	7.548 - 7	-6.122	2.348 -10	-9.6294
210	864.8	14.398	15.448	15.384	13.030		22.00	35.55	6.550	-6.184	2.005	-9.6979
215	868.5	14.309	15.402	15.305	13.018		21.75	36.14	5.697	-6.244	1.718	-9.7650
220	869.5	14.217	15.357	15.227	13.006		21.50	36.70	4.966	-6.304	1.477	-9.8306
225	873.6	14.127	15.311	15.148	12.994		21.26	37.36	4.339	-6.363	1.270	-9.8963
230	877.2	14.038	15.266	15.070	12.982		21.01	38.00	3.800	-6.420	1.095	-9.9607
235	880.2	13.950	15.221	14.992	12.970		20.78	38.62	3.335	-6.477	9.467 -11	-10.0238
240	882.9	13.862	15.177	14.915	12.959		20.54	39.24	2.933	-6.533	8.208	-10.0857
245	885.2	13.775	15.132	14.839	12.947		20.32	39.84	2.585	-6.588	7.135	-10.1466
250	887.2	13.689	15.089	14.763	12.936		20.10	40.43	2.282	-6.642	6.217	-10.2064
255	888.9	13.602	15.045	14.687	12.925		19.88	41.01	2.018 - 7	-6.695	5.429 -11	-10.2653
260	890.4	13.516	15.002	14.612	12.914		19.67	41.58	1.788	-6.748	4.751	-10.3232
265	891.7	13.431	14.959	14.537	12.903		19.47	42.13	1.587	-6.800	4.167	-10.3802
270	892.8	13.346	14.916	14.463	12.892		19.27	42.68	1.410	-6.851	3.661	-10.4364
275	893.8	13.261	14.873	14.388	12.881		19.08	43.22	1.255	-6.901	3.223	-10.4917
280	894.6	13.176	14.831	14.314	12.870		18.90	43.75	1.119	-6.951	2.843	-10.5462
285	895.3	13.092	14.789	14.240	12.859		18.72	44.26	9.987 - 8	-7.001	2.512	-10.6000
290	896.0	13.008	14.746	14.167	12.849		18.55	44.77	8.926	-7.049	2.223	-10.6531
295	896.5	12.924	14.704	14.093	12.838		18.38	45.27	7.988	-7.098	1.970	-10.7055
300	897.0	12.841	14.662	14.020	12.828		18.23	45.76	7.157	-7.145	1.749	-10.7572
310	897.7	12.676	14.579	13.874	12.807		17.93	46.70	5.765 - 8	-7.239	1.385 -11	-10.8587
320	898.3	12.508	14.496	13.729	12.786		17.65	47.61	4.663	-7.331	1.102	-10.9578
330	898.7	12.343	14.413	13.584	12.765		17.39	48.48	3.787	-7.422	8.815 -12	-11.0548
340	899.0	12.178	14.331	13.440	12.744		17.15	49.31	3.087	-7.511	7.083	-11.1498
350	899.3	12.014	14.248	13.296	12.724		16.93	50.13	2.524	-7.598	5.716	-11.2429
360	899.5	11.850	14.167	13.153	12.703		16.72	50.91	2.071	-7.684	4.631	-11.3343
370	899.6	11.687	14.085	13.010	12.683		16.52	51.69	1.704	-7.768	3.765	-11.4242
380	899.7	11.525	14.004	12.968	12.662		16.33	52.45	1.406	-7.852	3.071	-11.5127
390	899.8	11.363	13.923	12.726	12.642		16.15	53.21	1.164	-7.934	2.512	-11.5999
400	899.8	11.201	13.842	12.585	12.622		15.97	53.98	9.657 - 9	-8.015	2.061	-11.6859

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
410	990.9	11.040	13.761	12.444	12.607		15.79	54.76	8.035 - 9	-8.095	1.695 -12	-11.7707
420	990.9	10.880	13.681	12.303	12.582		15.60	55.57	6.703	-8.174	1.398	-11.8545
430	990.9	10.720	13.601	12.163	12.562		15.42	56.41	5.606	-8.251	1.155	-11.9374
440	990.9	10.560	13.521	12.023	12.542		15.22	57.30	4.702	-8.328	9.566 -13	-12.0193
450	990.0	10.401	13.442	11.884	12.522		15.02	58.24	3.954	-8.403	7.939	-12.1003
460	990.0	10.242	13.363	11.745	12.502		14.81	59.25	3.335	-8.477	6.601	-12.1804
470	990.0	10.084	13.283	11.607	12.482		14.58	60.35	2.822	-8.549	5.499	-12.2597
480	990.0	9.927	13.205	11.469	12.462		14.34	61.54	2.395	-8.621	4.590	-12.3382
490	990.0	9.769	13.126	11.331	12.443		14.09	62.84	2.039	-8.691	3.838	-12.4159
500	990.0	9.613	13.048	11.194	12.423	10.734	13.81	64.27	1.742	-8.759	3.216	-12.4927
510	990.0	9.456	12.969	11.057	12.403	10.729	13.52	65.84	1.494 - 9	-8.826	2.700 -13	-12.5687
520	990.0	9.300	12.892	10.920	12.384	10.725	13.22	67.57	1.286	-8.891	2.271	-12.6438
530	990.0	9.145	12.814	10.784	12.365	10.720	12.89	69.48	1.111	-8.954	1.914	-12.7180
540	990.0	8.990	12.736	10.649	12.345	10.715	12.55	71.58	9.642 -10	-9.016	1.617	-12.7913
550	990.0	8.836	12.659	10.514	12.326	10.710	12.19	73.90	8.403	-9.076	1.369	-12.8637
560	990.0	8.682	12.582	10.379	12.307	10.705	11.82	76.45	7.356	-9.133	1.162	-12.9349
570	990.0	8.528	12.505	10.244	12.287	10.700	11.43	79.26	6.469	-9.189	9.883 -14	-13.0051
580	990.0	8.375	12.429	10.110	12.268	10.695	11.04	82.33	5.716	-9.243	8.430	-13.0742
590	990.0	8.222	12.352	9.976	12.249	10.691	10.63	85.69	5.074	-9.295	7.211	-13.1420
600	990.0	8.070	12.276	9.843	12.230	10.686	10.23	89.34	4.526	-9.344	6.187	-13.2085
610	990.0	7.918	12.200	9.710	12.211	10.681	9.82	93.29	4.056 -10	-9.392	5.325 -14	-13.2736
620	990.0	7.767	12.125	9.578	12.192	10.676	9.43	97.55	3.652	-9.437	4.599	-13.3373
630	990.0	7.616	12.049	9.445	12.173	10.671	9.03	102.13	3.304	-9.481	3.986	-13.3995
640	990.0	7.465	11.974	9.314	12.154	10.667	8.64	107.01	3.003	-9.522	3.467	-13.4601
650	990.0	7.315	11.899	9.182	12.136	10.662	8.26	112.19	2.741	-9.562	3.027	-13.5190
660	990.0	7.165	11.824	9.051	12.117	10.657	7.90	117.63	2.512	-9.600	2.654	-13.5762
670	990.0	7.016	11.749	8.921	12.098	10.653	7.56	123.33	2.312	-9.636	2.336	-13.6315
680	990.0	6.867	11.675	8.790	12.080	10.648	7.23	129.25	2.136	-9.670	2.065	-13.6851
690	990.0	6.719	11.601	8.660	12.061	10.643	6.93	135.36	1.980	-9.703	1.833	-13.7367
700	990.0	6.571	11.527	8.531	12.043	10.639	6.64	141.61	1.842	-9.735	1.635	-13.7865
710	990.0	6.423	11.453	8.402	12.024	10.634	6.37	147.97	1.720 -10	-9.765	1.464 -14	-13.8343
720	990.0	6.276	11.379	8.273	12.006	10.629	6.13	154.38	1.609	-9.793	1.317	-13.8803
730	990.0	6.129	11.306	8.144	11.987	10.625	5.90	160.81	1.510	-9.821	1.190	-13.9243
740	990.0	5.983	11.233	8.016	11.969	10.620	5.69	167.20	1.421	-9.847	1.080	-13.9665
750	990.0	5.837	11.160	7.888	11.951	10.615	5.50	173.51	1.340	-9.873	9.844 -15	-14.0068
760	990.0	5.691	11.087	7.761	11.933	10.611	5.32	179.70	1.266	-9.897	9.007	-14.0454
770	990.0	5.546	11.014	7.634	11.914	10.606	5.16	185.74	1.199	-9.921	8.273	-14.0823
780	990.0	5.402	10.942	7.507	11.896	10.602	5.02	191.59	1.137	-9.944	7.628	-14.1176
790	990.0	5.257	10.870	7.381	11.878	10.597	4.89	197.23	1.080	-9.967	7.058	-14.1513
800	990.0	5.113	10.798	7.255	11.860	10.593	4.77	202.65	1.027	-9.988	6.552	-14.1836
820	990.0	4.827	10.655	7.004	11.824	10.584	4.57	212.75	9.330 -11	-10.030	5.700 -15	-14.2441
840	990.0	4.542	10.512	6.755	11.789	10.575	4.41	221.86	8.510	-10.070	5.013	-14.2999
860	990.0	4.277	10.230	6.260	11.718	10.557	4.17	237.22	7.150	-10.146	3.983	-14.3997
900	990.0	3.696	10.090	6.014	11.683	10.548	4.08	243.65	6.579	-10.182	3.589	-14.4451
920	990.0	3.418	9.950	5.770	11.648	10.539	4.01	249.39	6.067	-10.217	3.251	-14.4880
940	990.0	3.141	9.812	5.528	11.613	10.530	3.95	254.55	5.604	-10.252	2.958	-14.5290
960	990.0	2.865	9.674	5.286	11.579	10.522	3.90	259.23	5.184	-10.285	2.702	-14.5684
980	990.0	2.591	9.537	5.046	11.545	10.513	3.86	263.54	4.802	-10.319	2.475	-14.6064
1000	990.0	2.318	9.400	4.808	11.511	10.505	3.82	267.55	4.454	-10.351	2.274	-14.6433

SUMMER MODEL, EXOSPHERIC TEMPERATURE = 1000° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
120	379.3	16.759	16.808	17.497	13.503		26.76	12.47	2.282 - 5	-4.642	1.936 - 8	-7.7130
125	469.2	16.480	16.623	17.241	13.422		26.45	15.63	1.597	-4.797	1.083	-7.9653
130	547.8	16.258	16.478	17.039	13.361		26.17	18.48	1.151	-4.924	6.845 - 9	-8.1646
135	614.2	16.073	16.361	16.870	13.313		25.91	20.96	9.243 - 6	-5.034	4.690	-8.3288
140	671.9	15.912	16.261	16.725	13.274		25.66	23.19	7.370	-5.133	3.385	-8.4704
145	720.2	15.770	16.174	16.596	13.241		25.42	25.13	5.993	-5.222	2.544	-8.5945
150	761.9	15.640	16.097	16.479	13.213		25.18	26.88	4.945	-5.306	1.965	-8.7065
155	796.6	15.520	16.028	16.372	13.188		24.94	28.41	4.127 - 6	-5.384	1.554 - 9	-8.8085
160	826.6	15.408	15.964	16.272	13.166		24.71	29.81	3.476	-5.459	1.250	-8.9032
165	851.4	15.302	15.904	16.178	13.147		24.48	31.04	2.949	-5.530	1.020	-8.9915
170	872.9	15.201	15.848	16.088	13.129		24.25	32.18	2.518	-5.599	8.411 -10	-9.0751
175	890.8	15.104	15.796	16.002	13.112		24.01	33.21	2.161	-5.665	7.006	-9.1545
180	906.3	15.010	15.745	15.919	13.097		23.78	34.16	1.863	-5.730	5.879	-9.2307
185	919.1	14.919	15.696	15.838	13.082		23.55	35.04	1.612	-5.793	4.969	-9.3038
190	930.1	14.831	15.649	15.760	13.069		23.32	35.87	1.400	-5.854	4.222	-9.3744
195	939.2	14.744	15.604	15.684	13.056		23.09	36.63	1.220	-5.914	3.607	-9.4429
200	947.1	14.658	15.559	15.608	13.043		22.86	37.37	1.066	-5.972	3.093	-9.5096
205	953.7	14.574	15.516	15.534	13.031		22.63	38.07	9.333 - 7	-6.030	2.664 -10	-9.5745
210	959.1	14.492	15.473	15.462	13.020		22.40	38.74	8.194	-6.086	2.302	-9.6379
215	963.3	14.410	15.431	15.390	13.008		22.17	39.37	7.209	-6.142	1.996	-9.6998
220	966.2	14.329	15.390	15.319	12.998		21.95	39.95	6.355	-6.197	1.736	-9.7604
225	968.8	14.249	15.350	15.249	12.987		21.72	40.54	5.613	-6.251	1.514	-9.8200
230	970.7	14.169	15.309	15.179	12.977		21.50	41.10	4.966	-6.304	1.323	-9.8785
235	974.5	14.089	15.269	15.108	12.966		21.28	41.75	4.401	-6.356	1.156	-9.9371
240	977.9	14.010	15.228	15.039	12.955		21.06	42.39	3.908	-6.408	1.012	-9.9946
245	980.8	13.931	15.188	14.969	12.945		20.85	43.01	3.476	-6.459	8.888 -11	-10.0512
250	983.3	13.852	15.148	14.901	12.934		20.64	43.63	3.097	-6.509	7.820	-10.1068
255	985.5	13.774	15.109	14.832	12.924		20.44	44.23	2.764 - 7	-6.558	6.894 -11	-10.1615
260	987.4	13.697	15.069	14.764	12.914		20.24	44.82	2.470	-6.607	6.089	-10.2154
265	989.0	13.620	15.030	14.696	12.904		20.04	45.41	2.211	-6.655	5.389	-10.2685
270	990.5	13.543	14.992	14.629	12.894		19.85	45.98	1.982	-6.703	4.777	-10.3208
275	991.7	13.466	14.953	14.562	12.884		19.66	46.55	1.779	-6.750	4.242	-10.3724
280	992.8	13.390	14.915	14.495	12.874		19.48	47.10	1.599	-6.796	3.773	-10.4233
285	993.8	13.314	14.877	14.429	12.865		19.30	47.65	1.439	-6.842	3.361	-10.4735
290	994.6	13.238	14.839	14.362	12.855		19.13	48.19	1.296	-6.887	2.999	-10.5231
295	995.3	13.162	14.801	14.296	12.845		18.96	48.72	1.169	-6.932	2.679	-10.5720
300	995.9	13.087	14.763	14.230	12.836		18.80	49.25	1.056	-6.976	2.397	-10.6203
310	996.9	12.937	14.687	14.098	12.817		18.49	50.27	8.635 - 8	-7.064	1.927 -11	-10.7152
320	997.7	12.787	14.612	13.967	12.798		18.21	51.25	7.091	-7.149	1.556	-10.8079
330	998.2	12.638	14.538	13.837	12.779		17.94	52.21	5.844	-7.233	1.263	-10.8985
340	998.7	12.490	14.464	13.707	12.760		17.69	53.13	4.834	-7.316	1.030	-10.9873
350	999.0	12.342	14.390	13.578	12.742		17.45	54.02	4.011	-7.397	8.428 -12	-11.0743
360	999.2	12.195	14.316	13.449	12.723		17.23	54.88	3.338	-7.477	6.924	-11.1596
370	999.4	12.048	14.243	13.320	12.705		17.03	55.72	2.786	-7.555	5.709	-11.2435
380	999.6	11.902	14.169	13.192	12.687		16.83	56.54	2.331	-7.632	4.722	-11.3259
390	999.7	11.756	14.096	13.064	12.668		16.65	57.34	1.956	-7.709	3.918	-11.4070
400	999.8	11.611	14.024	12.937	12.650		16.47	58.13	1.645	-7.784	3.259	-11.4869

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
410	999.8	11.466	13.951	12.810	12.632		16.30	58.92	1.386 - 8	-7.858	2.719 -12	-11.5656
420	999.9	11.321	13.879	12.684	12.614		16.14	59.71	1.171	-7.931	2.273	-11.6433
430	999.9	11.177	13.807	12.558	12.596		15.97	60.50	9.917 - 9	-8.004	1.905	-11.7200
440	999.9	11.034	13.735	12.432	12.578		15.81	61.31	8.416	-8.075	1.600	-11.7958
450	999.9	10.890	13.664	12.307	12.560		15.64	62.13	7.157	-8.145	1.347	-11.8707
460	1000.0	10.748	13.592	12.182	12.542		15.48	62.99	6.100	-8.215	1.135	-11.9448
470	1000.0	10.605	13.521	12.057	12.524		15.31	63.89	5.210	-8.283	9.591 -13	-12.0181
480	1000.0	10.463	13.450	11.933	12.507		15.13	64.83	4.460	-8.351	8.115	-12.0907
490	1000.0	10.322	13.379	11.809	12.489		14.94	65.83	3.827	-8.417	6.878	-12.1626
500	1000.0	10.181	13.309	11.685	12.471	10.430	14.75	66.89	3.292	-8.483	5.839	-12.2337
510	1000.0	10.040	13.238	11.562	12.454	10.426	14.54	68.03	2.838 - 9	-8.547	4.964 -13	-12.3042
520	1000.0	9.900	13.168	11.439	12.436	10.421	14.33	69.25	2.453	-8.610	4.227	-12.3739
530	1000.0	9.760	13.098	11.317	12.419	10.417	14.10	70.58	2.126	-8.672	3.606	-12.4430
540	1000.0	9.620	13.029	11.195	12.401	10.412	13.86	72.01	1.848	-8.733	3.080	-12.5114
550	1000.0	9.481	12.959	11.073	12.384	10.408	13.60	73.57	1.611	-8.793	2.635	-12.5791
560	1000.0	9.343	12.890	10.952	12.367	10.404	13.34	75.27	1.408	-8.851	2.259	-12.6462
570	1000.0	9.205	12.821	10.831	12.349	10.399	13.05	77.12	1.235	-8.908	1.939	-12.7124
580	1000.0	9.067	12.752	10.710	12.332	10.395	12.76	79.13	1.087	-8.964	1.667	-12.7780
590	1000.0	8.929	12.683	10.590	12.315	10.391	12.45	81.32	9.592 -10	-9.018	1.436	-12.8427
600	1000.0	8.792	12.614	10.470	12.298	10.386	12.13	83.71	8.496	-9.071	1.240	-12.9067
610	1000.0	8.656	12.546	10.350	12.281	10.382	11.80	86.30	7.553 -10	-9.122	1.072 -13	-12.9698
620	1000.0	8.519	12.478	10.231	12.264	10.378	11.46	89.11	6.739	-9.171	9.289 -14	-13.0320
630	1000.0	8.383	12.410	10.112	12.247	10.373	11.11	92.16	6.035	-9.219	8.067	-13.0933
640	1000.0	8.248	12.342	9.993	12.230	10.369	10.76	95.45	5.424	-9.266	7.021	-13.1536
650	1000.0	8.113	12.275	9.875	12.213	10.365	10.41	99.00	4.894	-9.310	6.125	-13.2129
660	1000.0	7.978	12.207	9.757	12.196	10.361	10.05	102.80	4.432	-9.353	5.357	-13.2711
670	1000.0	7.844	12.140	9.639	12.179	10.356	9.69	106.88	4.029	-9.395	4.697	-13.3282
680	1000.0	7.710	12.073	9.522	12.162	10.352	9.34	111.22	3.676	435	4.130	-13.3841
690	1000.0	7.576	12.006	9.405	12.146	10.348	9.00	115.83	3.366	-9473	3.641	-13.4388
700	1000.0	7.443	11.940	9.289	12.129	10.344	8.66	120.70	3.093	-9.510	3.220	-13.4921
710	1000.0	7.310	11.873	9.172	12.112	10.340	8.33	125.81	2.852 -10	-9.545	2.856 -14	-13.5442
720	1000.0	7.178	11.807	9.056	12.096	10.335	8.01	131.17	2.638	-9.579	2.542	-13.5949
730	1000.0	7.046	11.741	8.941	12.079	10.331	7.71	136.74	2.448	-9.611	2.269	-13.6441
740	1000.0	6.914	11.675	8.826	12.063	10.327	7.42	142.51	2.279	-9.642	2.032	-13.6923
750	1000.0	6.783	11.610	8.711	12.046	10.323	7.14	148.44	2.128	-9.672	1.827	-13.7383
760	1000.0	6.652	11.544	8.596	12.030	10.319	6.88	154.52	1.992	-9.701	1.647	-13.7832
770	1000.0	6.521	11.479	8.482	12.014	10.315	6.63	160.70	1.869	-9.728	1.491	-13.8266
780	1000.0	6.391	11.414	8.368	11.997	10.311	6.40	166.95	1.758	-9.755	1.354	-13.8684
790	1000.0	6.261	11.349	8.254	11.981	10.307	6.19	173.24	1.658	-9.780	1.234	-13.9088
800	1000.0	6.132	11.284	8.141	11.965	10.302	5.99	179.52	1.567	-9.805	1.128	-13.9477
820	1000.0	5.874	11.155	7.915	11.933	10.294	5.63	191.96	1.407 -10	-9.852	9.525 -15	-14.0212
840	1000.0	5.617	11.027	7.690	11.901	10.286	5.33	204.00	1.272	-9.896	8.146	-14.0890
860	1000.0	5.108	10.773	7.245	11.837	10.270	4.86	226.12	1.056	-9.976	6.171	-14.2097
900	1000.0	4.856	10.646	7.024	11.805	10.262	4.68	235.95	9.682 -11	-10.014	5.453	-14.2634
920	1000.0	4.605	10.521	6.804	11.774	10.254	4.54	244.90	8.910	-10.050	4.861	-14.3133
940	1000.0	4.356	10.396	6.586	11.743	10.247	4.42	252.98	8.222	-10.085	4.367	-14.3599
960	1000.0	4.108	10.272	6.369	11.712	10.239	4.32	260.25	7.606	-10.119	3.948	-14.4036
980	1000.0	3.861	10.149	6.153	11.681	10.231	4.23	266.75	7.050	-10.152	3.590	-14.4449
1000	1000.0	3.616	10.026	5.938	11.650	10.223	4.17	272.59	6.546	-10.184	3.280	-14.4842

SUMMER MODEL, EXOSPHERIC TEMPERATURE = 1100° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
120	379.7	16.758	16.808	17.496	13.502		26.76	12.49	2.281 - 5	-4.642	1.934 - 8	-7.7136
125	479.8	16.473	16.614	17.234	13.416		26.46	15.99	1.604	-4.795	1.064	-7.9732
130	567.8	16.249	16.466	17.029	13.352		26.19	19.14	1.206	-4.919	6.690 - 9	-8.1746
135	642.9	16.066	16.347	16.861	13.302		25.94	21.92	9.453 - 6	-5.024	4.587	-8.3385
140	708.5	15.907	16.247	16.717	13.261		25.70	24.42	7.618	-5.118	3.324	-8.4784
145	763.9	15.768	16.161	16.591	13.228		25.47	26.60	6.263	-5.203	2.512	-8.6001
150	812.0	15.642	16.085	16.478	13.199		25.25	28.57	5.225	-5.282	1.954	-8.7091
155	852.4	15.527	16.017	16.375	13.174		25.03	30.30	4.409 - 6	-5.356	1.557 - 9	-8.8077
160	887.6	15.420	15.954	16.279	13.152		24.82	31.87	3.754	-5.426	1.262	-8.8988
165	917.0	15.320	15.897	16.189	13.133		24.60	33.26	3.220	-5.492	1.039	-8.9834
170	942.5	15.224	15.843	16.104	13.115		24.39	34.54	2.778	-5.556	8.648 -10	-9.0631
175	963.8	15.133	15.793	16.023	13.098		24.18	35.68	2.410	-5.618	7.271	-9.1384
180	982.4	15.045	15.745	15.945	13.083		23.97	36.75	2.099	-5.678	6.159	-9.2105
185	998.0	14.960	15.699	15.869	13.069		23.76	37.72	1.835	-5.736	5.255	-9.2795
190	1011.5	14.877	15.654	15.796	13.056		23.55	38.63	1.610	-5.793	4.508	-9.3460
195	1022.9	14.796	15.612	15.725	13.044		23.34	39.47	1.416	-5.849	3.887	-9.4104
200	1032.6	14.717	15.570	15.655	13.032		23.13	40.27	1.250	-5.903	3.366	-9.4728
205	1040.9	14.639	15.529	15.587	13.020		22.92	41.02	1.105 - 6	-5.957	2.926 -10	-9.5337
210	1047.6	14.563	15.490	15.519	13.009		22.71	41.73	9.791 - 7	-6.009	2.553	-9.5929
215	1053.4	14.488	15.451	15.453	12.999		22.50	42.41	8.694	-6.061	2.234	-9.6509
220	1058.0	14.413	15.413	15.388	12.988		22.30	43.06	7.734	-6.112	1.961	-9.7076
225	1061.5	14.339	15.375	15.323	12.978		22.09	43.67	6.892	-6.162	1.725	-9.7632
230	1063.9	14.267	15.338	15.259	12.969		21.89	44.25	6.151	-6.211	1.522	-9.8176
235	1066.4	14.194	15.301	15.195	12.959		21.68	44.84	5.498	-6.260	1.345	-9.8714
240	1070.6	14.121	15.264	15.131	12.949		21.48	45.51	4.922	-6.308	1.188	-9.9253
245	1074.3	14.049	15.227	15.068	12.939		21.28	46.16	4.413	-6.355	1.052	-9.9782
250	1077.6	13.977	15.190	15.005	12.930		21.09	46.80	3.963	-6.402	9.328 -11	-10.0302
255	1080.4	13.905	15.154	14.942	12.920		20.89	47.43	3.564 - 7	-6.448	8.290 -11	-10.0815
260	1082.9	13.834	15.118	14.880	12.911		20.70	48.05	3.210	-6.494	7.381	-10.1319
265	1085.0	13.764	15.082	14.818	12.902		20.52	48.65	2.894	-6.538	6.582	-10.1816
270	1086.9	13.693	15.047	14.756	12.893		20.33	49.25	2.613	-6.583	5.880	-10.2306
275	1088.6	13.624	15.012	14.695	12.883		20.15	49.84	2.363	-6.627	5.261	-10.2790
280	1090.0	13.554	14.977	14.634	12.874		19.98	50.43	2.138	-6.670	4.713	-10.3267
285	1091.3	13.484	14.942	14.573	12.866		19.80	51.00	1.938	-6.713	4.229	-10.3737
290	1092.4	13.415	14.907	14.512	12.857		19.64	51.57	1.758	-6.755	3.800	-10.4202
295	1093.3	13.346	14.872	14.452	12.848		19.47	52.13	1.596	-6.797	3.419	-10.4661
300	1094.2	13.278	14.838	14.392	12.839		19.31	52.68	1.451	-6.838	3.080	-10.5115
310	1095.5	13.141	14.769	14.272	12.822		19.00	53.76	1.202 - 7	-6.920	2.508 -11	-10.6006
320	1096.6	13.005	14.701	14.153	12.805		18.71	54.81	1.000	-7.000	2.052	-10.6878
330	1097.4	12.869	14.633	14.034	12.787		18.44	55.84	8.346 - 8	-7.079	1.687	-10.7730
340	1098.0	12.734	14.565	13.916	12.770		18.18	56.83	6.989	-7.156	1.392	-10.8565
350	1098.5	12.600	14.498	13.798	12.753		17.94	57.80	5.870	-7.231	1.153	-10.9383
360	1098.8	12.466	14.431	13.681	12.737		17.71	58.74	4.944	-7.306	9.583 -12	-11.0185
370	1099.1	12.332	14.364	13.564	12.720		17.49	59.65	4.176	-7.379	7.993	-11.0973
380	1099.3	12.199	14.297	13.447	12.703		17.29	60.54	3.535	-7.452	6.688	-11.1747
390	1099.5	12.067	14.231	13.331	12.687		17.10	61.41	3.001	-7.523	5.613	-11.2508
400	1099.6	11.934	14.165	13.215	12.670		16.92	62.25	2.553	-7.593	4.724	-11.3257

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
410	1099.7	11.803	14.099	13.100	12.654		16.75	63.09	2.176 - 8	-7.662	3.986 -12	-11.3995
420	1099.8	11.671	14.033	12.985	12.637		16.58	63.91	1.859	-7.731	3.371	-11.4722
430	1099.8	11.540	13.968	12.870	12.621		16.42	64.72	1.591	-7.798	2.858	-11.5439
440	1099.9	11.410	13.903	12.756	12.604		16.27	65.53	1.365	-7.865	2.428	-11.6148
450	1099.9	11.280	13.837	12.642	12.588		16.12	66.34	1.173	-7.931	2.067	-11.6847
460	1099.9	11.150	13.773	12.529	12.572		15.97	67.16	1.010	-7.996	1.763	-11.7538
470	1099.9	11.020	13.708	12.415	12.556		15.82	68.00	8.707 - 9	-8.060	1.506	-11.8222
480	1100.0	10.891	13.643	12.302	12.539		15.67	68.85	7.523	-8.124	1.289	-11.8898
490	1100.0	10.763	13.579	12.190	12.523		15.52	69.73	6.512	-8.186	1.105	-11.9567
500	1100.0	10.634	13.515	12.077	12.507	10.175	15.36	70.64	5.647	-8.248	9.485 -13	-12.0230
510	1100.0	10.506	13.451	11.965	12.491	10.171	15.20	71.59	4.906 - 9	-8.309	8.155 -13	-12.0886
520	1100.0	10.379	13.387	11.854	12.475	10.167	15.04	72.59	4.271	-8.369	7.022	-12.1536
530	1100.0	10.252	13.324	11.742	12.459	10.163	14.86	73.64	3.725	-8.429	6.054	-12.2180
540	1100.0	10.125	13.260	11.632	12.444	10.159	14.68	74.76	3.255	-8.487	5.227	-12.2818
550	1100.0	9.999	13.197	11.521	12.428	10.155	14.50	75.94	2.851	-8.545	4.519	-12.3450
560	1100.0	9.873	13.134	11.411	12.412	10.151	14.30	77.21	2.502	-8.602	3.912	-12.4076
570	1100.0	9.747	13.071	11.300	12.396	10.147	14.09	78.57	2.200	-8.658	3.391	-12.4697
580	1100.0	9.622	13.008	11.191	12.381	10.143	13.88	80.03	1.939	-8.712	2.943	-12.5312
590	1100.0	9.497	12.946	11.081	12.365	10.139	13.65	81.59	1.714	-8.766	2.558	-12.5922
600	1100.0	9.372	12.884	10.972	12.349	10.135	13.41	83.28	1.518	-8.819	2.226	-12.6525
610	1100.0	9.248	12.822	10.864	12.334	10.131	13.16	85.10	1.348 - 9	-8.870	1.940 -13	-12.7122
620	1100.0	9.124	12.760	10.755	12.318	10.127	12.90	87.07	1.200	-8.921	1.693	-12.7713
630	1100.0	9.000	12.698	10.647	12.303	10.123	12.63	89.18	1.071	-8.970	1.480	-12.8298
640	1100.0	8.877	12.636	10.539	12.288	10.119	12.35	91.47	9.590 -10	-9.018	1.295	-12.8877
650	1100.0	8.754	12.575	10.432	12.272	10.115	12.06	93.93	8.609	-9.065	1.135	-12.9448
660	1100.0	8.632	12.514	10.326	12.257	10.111	11.77	96.58	7.751	-9.111	9.971 -14	-13.0013
670	1100.0	8.510	12.453	10.217	12.242	10.108	11.46	99.42	6.999	-9.155	8.771	-13.0570
680	1100.0	8.388	12.392	10.111	12.226	10.104	11.15	102.48	6.338	-9.198	7.728	-13.1119
690	1100.0	8.267	12.331	10.005	12.211	10.100	10.84	105.75	5.758	-9.240	6.823	-13.1661
700	1100.0	8.146	12.270	9.899	12.196	10.096	10.52	109.25	5.246	-9.280	6.034	-13.2194
710	1100.0	8.025	12.210	9.793	12.181	10.092	10.20	112.98	4.795 -10	-9.319	5.348 -14	-13.2718
720	1100.0	7.904	12.150	9.687	12.166	10.089	9.88	116.94	4.395	-9.357	4.750	-13.3233
730	1100.0	7.784	12.090	9.582	12.151	10.085	9.57	121.15	4.041	-9.394	4.227	-13.3739
740	1100.0	7.665	12.030	9.478	12.136	10.081	9.26	125.58	3.726	-9.429	3.771	-13.4236
750	1100.0	7.545	11.970	9.373	12.121	10.077	8.95	130.26	3.446	-9.463	3.372	-13.4722
760	1100.0	7.426	11.911	9.269	12.106	10.073	8.65	135.16	3.196	-9.495	3.022	-13.5197
770	1100.0	7.307	11.851	9.165	12.091	10.070	8.36	140.28	2.972	-9.527	2.715	-13.5662
780	1100.0	7.189	11.792	9.061	12.076	10.066	8.07	145.61	2.771	-9.557	2.446	-13.6116
790	1100.0	7.071	11.733	8.958	12.062	10.062	7.80	151.14	2.590	-9.587	2.209	-13.6558
800	1100.0	6.953	11.674	8.855	12.047	10.059	7.54	156.84	2.427	-9.615	2.000	-13.6989
820	1100.0	6.719	11.557	8.650	12.018	10.051	7.05	168.69	2.147 -10	-9.668	1.654 -14	-13.7815
840	1100.0	6.486	11.440	8.445	11.988	10.044	6.61	180.97	1.914	-9.718	1.383	-13.8593
860	1100.0	6.023	11.209	8.041	11.931	10.029	5.87	205.95	1.556	-9.808	9.987 -15	-14.0005
900	1100.0	5.794	11.095	7.840	11.902	10.022	5.57	218.21	1.416	-9.849	8.625	-14.0642
920	1100.0	5.566	10.981	7.640	11.873	10.015	5.31	230.05	1.295	-9.888	7.524	-14.1235
940	1100.0	5.339	10.867	7.442	11.845	10.008	5.09	241.32	1.190	-9.924	6.625	-14.1788
960	1100.0	5.113	10.754	7.244	11.817	10.001	4.90	251.91	1.097	-9.960	5.885	-14.2303
980	1100.0	4.889	10.642	7.048	11.789	9.994	4.75	261.75	1.015	-9.993	5.268	-14.2784
1000	1100.0	4.666	10.531	6.852	11.761	9.987	4.61	270.81	9.417 -11	-10.026	4.749	-14.3234

SUMMER MODEL, EXOSPHERIC TEMPERATURE = 1300° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
120	379.7	16.758	16.807	17.496	13.502		26.76	12.49	2.277 - 5	-4.643	1.930 - 8	-7.7144
125	493.4	16.463	16.603	17.223	13.409		26.46	18.44	1.609	-4.793	1.038	-7.9838
130	594.8	16.236	16.449	17.015	13.340		26.20	20.04	1.223	-4.913	6.478 - 9	-8.1886
135	683.5	16.053	16.327	16.847	13.288		25.96	23.28	9.705 - 6	-5.013	4.434	-8.3532
140	762.0	15.897	16.226	16.705	13.245		25.74	26.21	7.929	-5.101	3.222	-8.4919
145	829.4	15.762	16.140	16.582	13.210		25.53	28.81	6.612	-5.180	2.448	-8.6111
150	889.2	15.641	16.064	16.472	13.180		25.33	31.18	5.597	-5.252	1.918	-8.7172
155	940.9	15.531	15.997	16.372	13.154		25.14	33.30	4.793 - 6	-5.319	1.540 - 9	-8.8124
160	986.3	15.429	15.936	16.281	13.131		24.95	35.23	4.142	-5.383	1.260	-8.8996
165	1024.9	15.335	15.880	16.196	13.111		24.76	36.94	3.607	-5.443	1.048	-8.9797
170	1058.9	15.246	15.829	16.117	13.093		24.58	38.51	3.159	-5.500	8.818 -10	-9.0546
175	1087.9	15.162	15.781	16.042	13.076		24.39	39.92	2.781	-5.556	7.499	-9.1253
180	1113.7	15.082	15.736	15.970	13.061		24.21	41.24	2.459	-5.609	6.428	-9.1919
185	1135.7	15.004	15.693	15.901	13.047		24.03	42.44	2.182	-5.661	5.552	-9.2556
190	1155.2	14.929	15.652	15.835	13.034		23.85	43.56	1.942	-5.712	4.822	-9.3167
195	1172.0	14.857	15.612	15.770	13.022		23.67	44.60	1.734	-5.761	4.212	-9.3755
200	1186.7	14.786	15.574	15.708	13.011		23.49	45.57	1.552	-5.809	3.695	-9.4324
205	1199.5	14.717	15.537	15.647	13.000		23.31	44.49	1.392 - 6	-5.856	3.254 -10	-9.4876
210	1210.3	14.649	15.501	15.587	12.989		23.13	47.34	1.252	-5.903	2.877	-9.5411
215	1219.8	14.583	15.466	15.528	12.979		22.95	48.16	1.127	-5.948	2.551	-9.5933
220	1227.9	14.517	15.432	15.471	12.970		22.78	48.93	1.017	-5.993	2.268	-9.6443
225	1234.7	14.453	15.399	15.414	12.960		22.60	49.66	9.187 - 7	-6.037	2.022	-9.6941
230	1240.3	14.389	15.366	15.358	12.951		22.42	50.35	8.313	-6.080	1.808	-9.7429
235	1245.1	14.326	15.334	15.302	12.943		22.25	51.02	7.532	-6.123	1.619	-9.7908
240	1249.1	14.263	15.302	15.247	12.934		22.07	51.67	6.833	-6.165	1.452	-9.8379
245	1252.1	14.201	15.270	15.193	12.926		21.90	52.28	6.206	-6.207	1.306	-9.8842
250	1257.5	14.139	15.238	15.138	12.917		21.73	53.00	5.644	-6.248	1.173	-9.9307
255	1262.3	14.077	15.206	15.084	12.909		21.56	53.70	5.139 - 7	-6.289	1.056 -10	-9.9765
260	1266.5	14.016	15.175	15.030	12.900		21.39	54.39	4.685	-6.329	9.516 -11	-10.0215
265	1270.3	13.955	15.144	14.977	12.892		21.22	55.07	4.276	-6.369	8.592	-10.0659
270	1273.6	13.895	15.113	14.924	12.884		21.06	55.73	3.907	-6.408	7.769	-10.1096
275	1276.6	13.835	15.082	14.871	12.876		20.89	56.38	3.574	-6.447	7.035	-10.1527
280	1279.2	13.775	15.052	14.818	12.868		20.73	57.02	3.272	-6.485	6.379	-10.1953
285	1281.5	13.715	15.022	14.766	12.860		20.58	57.65	2.999	-6.523	5.791	-10.2373
290	1283.6	13.656	14.992	14.714	12.852		20.42	58.27	2.751	-6.561	5.263	-10.2787
295	1285.5	13.597	14.962	14.663	12.845		20.27	58.88	2.526	-6.598	4.790	-10.3197
300	1287.1	13.538	14.933	14.611	12.837		20.12	59.49	2.321	-6.634	4.363	-10.3602
310	1289.8	13.422	14.874	14.509	12.822		19.82	60.68	1.965 - 7	-6.707	3.633 -11	-10.4398
320	1292.0	13.306	14.815	14.407	12.807		19.54	61.84	1.669	-6.777	3.037	-10.5176
330	1293.7	13.190	14.758	14.306	12.792		19.27	62.98	1.422	-6.847	2.548	-10.5938
340	1295.0	13.076	14.700	14.206	12.778		19.01	64.09	1.215	-6.915	2.145	-10.6685
350	1296.1	12.961	14.643	14.106	12.763		18.77	65.18	1.041	-6.983	1.813	-10.7417
360	1296.9	12.848	14.586	14.006	12.749		18.53	66.25	8.939 - 8	-7.049	1.536	-10.8135
370	1297.6	12.735	14.529	13.907	12.735		18.31	67.29	7.696	-7.114	1.306	-10.8841
380	1298.1	12.622	14.472	13.808	12.721		18.09	68.31	6.641	-7.178	1.113	-10.9534
390	1298.5	12.509	14.416	13.710	12.706		17.89	69.31	5.743	-7.241	9.517 -12	-11.0215
400	1298.8	12.397	14.360	13.612	12.692		17.70	70.28	4.976	-7.303	8.157	-11.0885

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
410	1299.1	12.286	14.304	13.514	12.678		17.52	71.24	4.320 - 8	-7.364	7.007 -12	-11.1544
420	1299.3	12.175	14.249	13.417	12.664		17.35	72.18	3.758	-7.425	6.034	-11.2194
430	1299.4	12.064	14.193	13.320	12.651		17.18	73.09	3.275	-7.485	5.207	-11.2834
440	1299.5	11.953	14.138	13.223	12.637		17.02	74.00	2.858	-7.544	4.503	-11.3465
450	1299.6	11.843	14.083	13.126	12.623		16.87	74.88	2.499	-7.602	3.902	-11.4087
460	1299.7	11.733	14.028	13.030	12.609		16.73	75.76	2.188	-7.660	3.387	-11.4702
470	1299.8	11.624	13.973	12.934	12.595		16.59	76.63	1.919	-7.717	2.945	-11.5309
480	1299.8	11.514	13.919	12.839	12.582		16.45	77.50	1.686	-7.773	2.566	-11.5908
490	1299.9	11.406	13.864	12.743	12.568		16.32	78.36	1.483	-7.829	2.238	-11.6501
500	1299.9	11.297	13.810	12.648	12.555	9.772	16.19	79.22	1.306	-7.884	1.956	-11.7087
510	1299.9	11.189	13.756	12.554	12.541	9.769	16.06	80.09	1.152 - 8	-7.939	1.711 -12	-11.7667
520	1299.9	11.081	13.702	12.459	12.528	9.766	15.93	80.97	1.017	-7.993	1.499	-11.8241
530	1299.9	10.973	13.648	12.365	12.514	9.762	15.80	81.86	8.997 - 9	-8.046	1.315	-11.8809
540	1300.0	10.866	13.594	12.271	12.501	9.759	15.67	82.77	7.968	-8.099	1.155	-11.9372
550	1300.0	10.759	13.541	12.177	12.487	9.755	15.54	83.71	7.066	-8.151	1.016	-11.9930
560	1300.0	10.652	13.487	12.084	12.474	9.752	15.41	84.66	6.275	-8.202	8.948 -13	-12.0483
570	1300.0	10.546	13.434	11.991	12.461	9.749	15.28	85.65	5.579	-8.253	7.887	-12.1031
580	1300.0	10.440	13.381	11.898	12.447	9.745	15.14	86.68	4.968	-8.304	6.960	-12.1574
590	1300.0	10.334	13.328	11.806	12.434	9.742	15.00	87.75	4.430	-8.354	6.148	-12.2113
600	1300.0	10.229	13.276	11.713	12.421	9.739	14.85	88.86	3.955	-8.403	5.436	-12.2647
610	1300.0	10.124	13.223	11.621	12.408	9.735	14.70	90.03	3.537 - 9	-8.451	4.812 -13	-12.3177
620	1300.0	10.019	13.171	11.529	12.395	9.732	14.55	91.26	3.168	-8.499	4.264	-12.3702
630	1300.0	9.914	13.118	11.438	12.382	9.729	14.39	92.55	2.841	-8.547	3.781	-12.4224
640	1300.0	9.810	13.066	11.347	12.369	9.725	14.22	93.92	2.552	-8.593	3.357	-12.4741
650	1300.0	9.706	13.014	11.256	12.356	9.722	14.04	95.36	2.296	-8.639	2.983	-12.5253
660	1300.0	9.603	12.963	11.165	12.343	9.719	13.86	96.89	2.069	-8.684	2.653	-12.5762
670	1300.0	9.499	12.911	11.075	12.330	9.716	13.67	98.51	1.868	-8.729	2.363	-12.6266
680	1300.0	9.396	12.859	10.984	12.317	9.712	13.47	100.23	1.689	-8.772	2.106	-12.6766
690	1300.0	9.293	12.808	10.894	12.304	9.709	13.27	102.06	1.530	-8.815	1.879	-12.7262
700	1300.0	9.191	12.757	10.805	12.291	9.706	13.06	104.00	1.388	-8.857	1.678	-12.7753
710	1300.0	9.089	12.706	10.715	12.278	9.703	12.84	106.06	1.262 - 9	-8.899	1.500 -13	-12.8239
720	1300.0	8.987	12.655	10.626	12.266	9.700	12.62	108.26	1.150	-8.939	1.342	-12.8721
730	1300.0	8.885	12.604	10.537	12.253	9.696	12.39	110.59	1.049	-8.979	1.203	-12.9198
740	1300.0	8.784	12.553	10.448	12.240	9.693	12.15	113.07	9.597 -10	-9.018	1.079	-12.9671
750	1300.0	8.683	12.503	10.360	12.228	9.690	11.91	115.70	8.793	-9.056	9.687 -14	-13.0138
760	1300.0	8.582	12.452	10.272	12.215	9.687	11.66	118.48	8.073	-9.093	8.709	-13.0600
770	1300.0	8.482	12.402	10.184	12.202	9.684	11.41	121.44	7.427	-9.129	7.839	-13.1057
780	1300.0	8.382	12.352	10.096	12.190	9.680	11.15	124.57	6.847	-9.164	7.065	-13.1509
790	1300.0	8.282	12.302	10.009	12.177	9.677	10.89	127.88	6.326	-9.199	6.376	-13.1955
800	1300.0	8.182	12.252	9.922	12.165	9.674	10.63	131.37	5.856	-9.232	5.762	-13.2395
820	1300.0	7.984	12.153	9.748	12.140	9.668	10.11	138.93	5.050 -10	-9.297	4.725 -14	-13.3256
840	1300.0	7.786	12.055	9.575	12.115	9.662	9.59	147.25	4.391	-9.357	3.897	-13.4092
860	1300.0	7.395	11.859	9.233	12.066	9.649	8.59	166.22	3.399	-9.469	2.703	-13.5682
900	1300.0	7.201	11.762	9.063	12.042	9.643	8.12	176.79	3.025	-9.519	2.274	-13.6433
920	1300.0	7.008	11.665	8.894	12.018	9.637	7.68	188.00	2.711	-9.567	1.927	-13.7152
940	1300.0	6.816	11.569	8.726	11.994	9.631	7.27	199.76	2.445	-9.612	1.644	-13.7840
960	1300.0	6.625	11.474	8.559	11.970	9.625	6.89	211.93	2.218	-9.654	1.414	-13.8495
980	1300.0	6.436	11.379	8.392	11.946	9.619	6.54	224.34	2.024	-9.694	1.225	-13.9118
1000	1300.0	6.247	11.285	8.227	11.923	9.613	6.23	236.99	1.856	-9.731	1.070	-13.9708

SUMMER MODEL, EXOSPHERIC TEMPERATURE = 1500° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
120	379.8	16.757	16.807	17.495	13.502		26.76	12.49	2.274 - 5	-4.643	1.927 - 8	-7.7151
125	499.5	16.457	16.598	17.218	13.406		26.46	16.84	1.610	-4.793	1.026	-7.9888
130	607.8	16.230	16.442	17.008	13.335		26.20	20.48	1.229	-4.910	6.375 - 9	-8.1955
135	704.4	16.046	16.318	16.839	13.280		25.97	23.98	9.816 - 6	-5.008	4.353	-8.3612
140	791.4	15.890	16.215	16.697	13.236		25.76	27.20	8.073	-5.093	3.161	-8.5002
145	868.4	15.755	16.127	16.574	13.199		25.56	30.13	6.781	-5.169	2.401	-8.6196
150	937.3	15.636	16.050	16.465	13.168		25.37	32.82	5.785	-5.238	1.884	-8.7250
155	997.2	15.528	15.983	16.367	13.141		25.19	35.22	4.995 - 6	-5.302	1.517 - 9	-8.8189
160	1051.0	15.429	15.922	16.277	13.117		25.01	37.44	4.353	-5.361	1.246	-8.9046
165	1098.5	15.337	15.867	16.195	13.096		24.84	39.47	3.822	-5.418	1.039	-8.9832
170	1141.0	15.251	15.816	16.117	13.077		24.67	41.34	3.377	-5.471	8.781 -10	-9.0564
175	1178.0	15.170	15.768	16.045	13.060		24.50	43.04	3.000	-5.523	7.504	-9.1247
180	1211.2	15.093	15.724	15.976	13.045		24.33	44.63	2.677	-5.572	6.467	-9.1893
185	1240.5	15.020	15.682	15.910	13.030		24.17	46.09	2.397	-5.620	5.617	-9.2505
190	1266.8	14.949	15.642	15.847	13.017		24.01	47.46	2.154	-5.667	4.910	-9.3089
195	1290.0	14.881	15.604	15.787	13.005		23.84	48.73	1.942	-5.712	4.316	-9.3649
200	1310.6	14.815	15.567	15.728	12.993		23.68	49.92	1.754	-5.756	3.813	-9.4187
205	1328.9	14.750	15.532	15.671	12.982		23.52	51.04	1.589 - 6	-5.799	3.383 -10	-9.4707
210	1344.9	14.688	15.498	15.615	12.972		23.36	52.08	1.442	-5.841	3.013	-9.5210
215	1359.3	14.626	15.465	15.561	12.962		23.21	53.08	1.311	-5.882	2.693	-9.5698
220	1371.8	14.566	15.433	15.508	12.952		23.05	54.01	1.194	-5.923	2.414	-9.6173
225	1383.1	14.507	15.402	15.456	12.943		22.89	54.91	1.090	-5.963	2.169	-9.6637
230	1392.9	14.449	15.371	15.404	12.934		22.74	55.77	9.955 - 7	-6.002	1.954	-9.7090
235	1401.4	14.392	15.341	15.354	12.926		22.58	56.58	9.107	-6.041	1.765	-9.7533
240	1408.6	14.335	15.312	15.304	12.918		22.43	57.35	8.342	-6.079	1.597	-9.7966
245	1414.8	14.280	15.283	15.255	12.910		22.27	58.09	7.650	-6.116	1.448	-9.8391
250	1420.0	14.224	15.255	15.207	12.902		22.12	58.79	7.022	-6.154	1.316	-9.8809
255	1427.8	14.169	15.226	15.158	12.894		21.97	59.62	6.454 - 7	-6.190	1.194 -10	-9.9229
260	1434.8	14.114	15.197	15.109	12.886		21.82	60.42	5.938	-6.226	1.086	-9.9642
265	1441.1	14.059	15.169	15.061	12.878		21.67	61.19	5.469	-6.262	9.890 -11	-10.0048
270	1446.9	14.005	15.141	15.014	12.870		21.52	61.95	5.043	-6.297	9.020	-10.0448
275	1452.0	13.952	15.114	14.967	12.863		21.37	62.70	4.654	-6.332	8.239	-10.0841
280	1456.7	13.899	15.086	14.920	12.856		21.23	63.42	4.299	-6.367	7.535	-10.1229
285	1460.9	13.846	15.059	14.874	12.848		21.08	64.13	3.975	-6.401	6.900	-10.1612
290	1464.7	13.793	15.032	14.828	12.841		20.94	64.83	3.678	-6.434	6.326	-10.1989
295	1468.1	13.741	15.006	14.782	12.834		20.80	65.52	3.407	-6.468	5.806	-10.2361
300	1471.2	13.690	14.980	14.736	12.827		20.66	66.20	3.158	-6.501	5.334	-10.2729
310	1476.6	13.587	14.927	14.646	12.814		20.39	67.52	2.719 - 7	-6.566	4.517 -11	-10.3452
320	1480.9	13.485	14.876	14.557	12.800		20.13	68.81	2.348	-6.629	3.839	-10.4158
330	1484.4	13.384	14.825	14.468	12.787		19.87	70.07	2.033	-6.692	3.274	-10.4849
340	1487.3	13.283	14.774	14.380	12.774		19.63	71.30	1.765	-6.753	2.802	-10.5526
350	1489.7	13.184	14.724	14.293	12.761		19.39	72.50	1.536	-6.814	2.405	-10.6190
360	1491.5	13.084	14.674	14.206	12.749		19.16	73.68	1.339	-6.873	2.070	-10.6841
370	1493.1	12.986	14.624	14.120	12.736		18.94	74.84	1.171	-6.932	1.786	-10.7480
380	1494.4	12.888	14.575	14.034	12.724		18.73	75.97	1.025	-6.989	1.546	-10.8109
390	1495.4	12.790	14.526	13.948	12.711		18.53	77.08	8.997 - 8	-7.046	1.341	-10.8726
400	1496.3	12.692	14.477	13.863	12.699		18.33	78.17	7.910	-7.102	1.166	-10.9334

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
410	1497.0	12.595	14.429	13.778	12.687		18.15	79.24	6.966 - 8	-7.157	1.016 -11	-10.9932
420	1497.5	12.499	14.380	13.693	12.675		17.97	80.29	6.145	-7.211	8.870 -12	-11.0521
430	1498.0	12.402	14.332	13.609	12.663		17.80	81.32	5.430	-7.265	7.761	-11.1101
440	1498.4	12.307	14.284	13.525	12.650		17.64	82.34	4.805	-7.318	6.804	-11.1673
450	1498.7	12.211	14.236	13.441	12.638		17.48	83.33	4.259	-7.371	5.976	-11.2236
460	1498.9	12.116	14.189	13.358	12.627		17.33	84.31	3.780	-7.423	5.257	-11.2792
470	1499.1	12.021	14.141	13.274	12.615		17.19	85.27	3.359	-7.474	4.633	-11.3341
480	1499.3	11.926	14.094	13.191	12.603		17.05	86.23	2.990	-7.524	4.090	-11.3883
490	1499.4	11.831	14.046	13.109	12.591		16.92	87.17	2.664	-7.574	3.615	-11.4418
500	1499.5	11.737	13.999	13.026	12.579	9.474	16.79	88.10	2.377	-7.624	3.201	-11.4947
510	1499.6	11.644	13.952	12.944	12.567	9.471	16.67	89.02	2.123 - 8	-7.673	2.838 -12	-11.5470
520	1499.7	11.550	13.906	12.862	12.556	9.468	16.54	89.94	1.898	-7.722	2.519	-11.5988
530	1499.7	11.457	13.859	12.781	12.544	9.465	16.43	90.85	1.700	-7.770	2.239	-11.6500
540	1499.8	11.364	13.812	12.699	12.532	9.462	16.31	91.77	1.523	-7.817	1.992	-11.7006
550	1499.8	11.271	13.766	12.618	12.521	9.459	16.20	92.68	1.367	-7.864	1.775	-11.7508
560	1499.9	11.179	13.720	12.537	12.509	9.456	16.08	93.61	1.228	-7.911	1.583	-11.8004
570	1499.9	11.086	13.674	12.456	12.498	9.454	15.97	94.53	1.104	-7.957	1.414	-11.8496
580	1499.9	10.994	13.629	12.376	12.486	9.451	15.86	95.47	9.935 - 9	-8.003	1.264	-11.8984
590	1499.9	10.903	13.582	12.296	12.475	9.448	15.75	96.43	8.952	-8.048	1.131	-11.9467
600	1499.9	10.811	13.536	12.216	12.463	9.445	15.64	97.40	8.074	-8.093	1.012	-11.9946
610	1499.9	10.720	13.491	12.136	12.452	9.442	15.52	98.39	7.290 - 9	-8.137	9.075 -13	-12.0421
620	1500.0	10.629	13.445	12.056	12.440	9.439	15.41	99.41	6.589	-8.181	8.142	-12.0893
630	1500.0	10.539	13.400	11.977	12.429	9.436	15.29	100.45	5.962	-8.225	7.311	-12.1360
640	1500.0	10.449	13.355	11.898	12.418	9.433	15.18	101.53	5.400	-8.268	6.570	-12.1824
650	1500.0	10.358	13.310	11.819	12.407	9.431	15.05	102.63	4.896	-8.310	5.910	-12.2284
660	1500.0	10.269	13.265	11.741	12.395	9.428	14.93	103.78	4.444	-8.352	5.320	-12.2741
670	1500.0	10.179	13.220	11.662	12.384	9.425	14.80	104.98	4.038	-8.394	4.792	-12.3194
680	1500.0	10.090	13.175	11.584	12.373	9.422	14.67	106.22	3.673	-8.435	4.321	-12.3644
690	1500.0	10.001	13.131	11.506	12.362	9.419	14.54	107.51	3.345	-8.476	3.899	-12.4091
700	1500.0	9.912	13.087	11.428	12.351	9.417	14.40	108.85	3.049	-8.516	3.520	-12.4534
710	1500.0	9.823	13.042	11.351	12.340	9.414	14.25	110.26	2.783 - 9	-8.555	3.181 -13	-12.4974
720	1500.0	9.735	12.998	11.273	12.329	9.411	14.11	111.74	2.544	-8.595	2.877	-12.5411
730	1500.0	9.647	12.954	11.196	12.318	9.408	13.95	113.28	2.327	-8.633	2.604	-12.5844
740	1500.0	9.559	12.910	11.120	12.307	9.405	13.79	114.91	2.132	-8.671	2.358	-12.6274
750	1500.0	9.472	12.866	11.043	12.296	9.403	13.63	116.61	1.955	-8.709	2.137	-12.6701
760	1500.0	9.384	12.823	10.966	12.285	9.400	13.46	118.40	1.796	-8.746	1.939	-12.7125
770	1500.0	9.297	12.779	10.890	12.274	9.397	13.29	120.28	1.652	-8.782	1.760	-12.7545
780	1500.0	9.211	12.736	10.814	12.263	9.394	13.11	122.26	1.521	-8.818	1.599	-12.7962
790	1500.0	9.124	12.693	10.738	12.252	9.392	12.93	124.34	1.402	-8.853	1.454	-12.8375
800	1500.0	9.038	12.649	10.663	12.241	9.389	12.74	126.53	1.295	-8.888	1.323	-12.8785
820	1500.0	8.866	12.563	10.512	12.220	9.384	12.35	131.25	1.109 - 9	-8.955	1.098 -13	-12.9594
840	1500.0	8.695	12.478	10.363	12.198	9.378	11.94	136.47	9.547 -10	-9.020	9.144 -14	-13.0389
860	1500.0	8.356	12.308	10.066	12.156	9.368	11.09	148.57	7.207	-9.142	6.411	-13.1931
900	1500.0	8.187	12.224	9.919	12.135	9.362	10.66	155.53	6.318	-9.199	5.399	-13.2677
920	1500.0	8.020	12.141	9.772	12.114	9.357	10.22	163.11	5.573	-9.254	4.565	-13.3406
940	1500.0	7.854	12.057	9.627	12.093	9.352	9.78	171.36	4.944	-9.306	3.877	-13.4115
960	1500.0	7.688	11.975	9.482	12.073	9.346	9.35	180.26	4.412	-9.355	3.307	-13.4806
980	1500.0	7.524	11.893	9.338	12.052	9.341	8.92	189.82	3.960	-9.402	2.834	-13.5476
1000	1500.0	7.360	11.811	9.194	12.032	9.336	8.52	200.00	3.574	-9.447	2.440	-13.6125

SUMMER MODEL, EXOSPHERIC TEMPERATURE = 1700° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
120	379.4	16.757	16.807	17.495	13.502		26.76	12.48	2.272 - 5	-4.643	1.928 - 8	-7.7149
125	500.3	16.457	16.597	17.217	13.405		26.46	16.87	1.609	-4.793	1.024	-7.9898
130	611.2	16.228	16.439	17.006	13.334		26.21	20.59	1.230	-4.910	6.342 - 9	-8.1978
135	712.2	16.042	16.313	16.835	13.278		25.98	24.24	9.836 - 6	-5.007	4.315	-8.3650
140	804.3	15.886	16.209	16.692	13.232		25.77	27.64	8.111	-5.091	3.126	-8.5054
145	887.3	15.751	16.120	16.568	13.194		25.57	30.77	6.835	-5.165	2.369	-8.6254
150	962.6	15.631	16.042	16.458	13.161		25.39	33.68	5.853	-5.233	1.856	-8.7313
155	1029.6	15.523	15.974	16.361	13.133		25.21	36.34	5.074 - 6	-5.295	1.494 - 9	-8.8256
160	1090.7	15.424	15.912	16.271	13.109		25.04	38.62	4.442	-5.352	1.226	-8.9114
165	1145.6	15.333	15.856	16.189	13.087		24.87	41.10	3.919	-5.407	1.023	-8.9899
170	1195.4	15.248	15.804	16.112	13.067		24.71	43.24	3.481	-5.458	8.655 -10	-9.0627
175	1239.8	15.169	15.756	16.040	13.049		24.55	45.21	3.109	-5.507	7.405	-9.1305
180	1280.1	15.093	15.711	15.973	13.033		24.39	47.05	2.790	-5.554	6.394	-9.1942
185	1316.2	15.022	15.670	15.908	13.018		24.24	48.76	2.513	-5.600	5.567	-9.2544
190	1349.0	14.953	15.630	15.847	13.004		24.09	50.36	2.272	-5.644	4.880	-9.3116
195	1378.6	14.887	15.592	15.788	12.991		23.94	51.87	2.060	-5.686	4.303	-9.3662
200	1405.5	14.823	15.556	15.731	12.979		23.79	53.30	1.874	-5.727	3.814	-9.4186
205	1430.0	14.761	15.521	15.676	12.967		23.64	54.65	1.708 - 6	-5.768	3.396 -10	-9.4691
210	1451.9	14.701	15.488	15.623	12.957		23.49	55.92	1.560	-5.807	3.036	-9.5176
215	1471.8	14.643	15.456	15.571	12.946		23.35	57.12	1.428	-5.845	2.725	-9.5647
220	1489.4	14.586	15.425	15.520	12.937		23.20	58.25	1.310	-5.883	2.454	-9.6102
225	1505.5	14.530	15.395	15.471	12.928		23.06	59.34	1.203	-5.920	2.216	-9.6545
230	1519.8	14.476	15.365	15.423	12.919		22.92	60.37	1.106	-5.956	2.007	-9.6975
235	1532.8	14.422	15.337	15.375	12.910		22.78	61.36	1.019	-5.992	1.821	-9.7396
240	1544.3	14.369	15.309	15.329	12.902		22.63	62.30	9.400 - 7	-6.027	1.657	-9.7807
245	1555.5	14.317	15.281	15.283	12.894		22.49	63.23	8.680	-6.061	1.510	-9.8211
250	1565.9	14.265	15.254	15.237	12.886		22.36	64.15	8.025	-6.096	1.378	-9.8608
255	1575.3	14.215	15.228	15.193	12.879		22.22	64.91	7.426 - 7	-6.129	1.262 -10	-9.8989
260	1583.0	14.164	15.201	15.148	12.871		22.08	65.86	6.880	-6.162	1.154	-9.9377
265	1592.8	14.114	15.174	15.104	12.863		21.94	66.78	6.380	-6.195	1.057	-9.9758
270	1601.7	14.065	15.148	15.060	12.856		21.81	67.67	5.923	-6.227	9.699 -11	-10.0133
275	1609.9	14.015	15.123	15.017	12.849		21.68	68.54	5.503	-6.259	8.912	-10.0500
280	1617.4	13.967	15.097	14.974	12.842		21.54	69.39	5.119	-6.291	8.200	-10.0862
285	1624.3	13.919	15.072	14.931	12.835		21.41	70.21	4.765	-6.322	7.554	-10.1218
290	1630.7	13.871	15.048	14.889	12.828		21.28	71.02	4.439	-6.353	6.968	-10.1569
295	1636.4	13.823	15.023	14.848	12.821		21.15	71.81	4.139	-6.383	6.435	-10.1914
300	1641.8	13.776	14.999	14.808	12.815		21.03	72.59	3.862	-6.413	5.949	-10.2255
310	1651.1	13.683	14.951	14.724	12.802		20.78	74.10	3.370 - 7	-6.472	5.101 -11	-10.2924
320	1658.9	13.591	14.904	14.644	12.789		20.54	75.56	2.948	-6.530	4.390	-10.3576
330	1665.5	13.500	14.858	14.564	12.777		20.30	76.97	2.586	-6.587	3.791	-10.4213
340	1671.0	13.410	14.812	14.485	12.765		20.07	78.35	2.274	-6.643	3.284	-10.4836
350	1675.6	13.321	14.767	14.406	12.753		19.84	79.69	2.003	-6.698	2.854	-10.5445
360	1679.5	13.232	14.722	14.329	12.742		19.63	81.00	1.769	-6.752	2.486	-10.6044
370	1682.8	13.144	14.678	14.252	12.730		19.42	82.28	1.565	-6.805	2.172	-10.6632
380	1685.6	13.057	14.633	14.175	12.719		19.21	83.53	1.387	-6.858	1.902	-10.7209
390	1687.9	12.970	14.590	14.099	12.708		19.02	84.76	1.232	-6.909	1.669	-10.7775
400	1689.8	12.883	14.546	14.023	12.697		18.83	85.97	1.096	-6.960	1.468	-10.8332

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
410	1691.4	12.797	14.503	13.947	12.686		18.65	87.15	9.761 - 8	-7.011	1.294 -11	-10.8880
420	1692.8	12.711	14.460	13.872	12.675		18.47	88.31	8.709	-7.060	1.143	-10.9420
430	1694.0	12.626	14.417	13.798	12.664		18.30	89.45	7.783	-7.109	1.011	-10.9951
440	1694.9	12.541	14.374	1 .723	12.653		18.14	90.57	6.964	-7.157	8.964 -12	-11.0475
450	1695.7	12.456	14.332	1 .649	12.643		17.98	91.67	6.241	-7.205	7.959	-11.0991
460	1696.4	12.372	14.290	1 .575	12.632		17.83	92.76	5.599	-7.252	7.079	-11.1501
470	1697.0	12.288	14.248	13.502	12.621		17.69	93.82	5.030	-7.298	6.305	-11.2003
480	1697.5	12.204	14.206	1 .428	12.611		17.55	94.88	4.524	-7.344	5.625	-11.2499
490	1697.9	12.121	14.164	1 .355	12.600		17.41	95.91	4.074	-7.390	5.025	-11.2989
500	1698.2	12.038	14.122	13 .282	12.590	9.249	17.28	96.93	3.673	-7.435	4.495	-11.3472
510	1698.5	11.955	14.081	13 .210	12.579	9.246	17.16	97.94	3.314 - 8	-7.480	4.027 -12	-11.3950
520	1698.7	11.872	14.039	13 .137	12.569	9.244	17.04	98.94	2.994	-7.524	3.612	-11.4423
530	1698.9	11.790	13.998	13 .065	12.559	9.241	16.92	99.93	2.708	-7.567	3.243	-11.4890
540	1699.1	11.708	13.957	12 .993	12.548	9.238	16.80	100.91	2.451	-7.611	2.916	-11.5353
550	1699.3	11.626	13.916	12.922	12.538	9.236	16.69	101.89	2.221	-7.653	2.624	-11.5810
560	1699.4	11.544	13.875	12.850	12.528	9.233	16.58	102.86	2.014	-7.696	2.364	-11.6263
570	1699.5	11.463	13.835	12.779	12.518	9.231	16.48	103.82	1.829	-7.738	2.132	-11.6711
580	1699.6	11.382	13.794	12.708	12.508	9.228	16.37	104.79	1.661	-7.780	1.925	-11.7155
590	1699.6	11.301	13.754	12.637	12.497	9.225	16.27	105.76	1.511	-7.821	1.740	-11.7595
600	1699.7	11.220	13.713	12. 67	12.487	9.223	16.17	106.73	1.375	-7.862	1.574	-11.8031
610	1699.7	11.140	13.673	12.496	12.477	9.220	16.07	107.70	1.253 - 8	-7.902	1.425 -12	-11.8463
620	1699.8	11.059	13.633	12.426	12.467	9.218	15.97	108.69	1.142	-7.942	1.291	-11.8892
630	1699.8	10.980	13.593	12.356	12.457	9.215	15.87	109.68	1.042	-7.982	1.170	-11.9317
640	1699.8	10.900	13.553	12.286	12.447	9.213	15.77	110.69	9.517 - 9	-8.022	1.062	-11.9739
650	1699.9	10.820	13.513	12.217	12.437	9.210	15.67	111.71	8.698	-8.061	9.647 -13	-12.0156
660	1699.9	10.741	13.474	12.147	12.427	9.208	15.58	112.74	7.957	-8.099	8.769	-12.0571
670	1699.9	10.662	13.434	12.078	12.418	9.205	15.47	113.80	7.285	-8.138	7.976	-12.0982
680	1699.9	10.583	13.395	12.009	12.408	9.203	15.37	114.88	6.674	-8.176	7.260	-12.1391
690	1699.9	10.505	13.356	11.940	12.398	9.200	15.27	115.99	6.121	-8.213	6.613	-12.1796
700	1699.9	10.426	13.316	11.872	12.388	9.198	15.16	117.12	5.617	-8.250	6.027	-12.2199
710	1700.0	10.348	13.277	11.803	12.378	9.195	15.06	118.29	5.160 - 9	-8.287	5.497 -13	-12.2599
720	1700.0	10.270	13.238	11.735	12.369	9.193	14.95	119.49	4.744	-8.324	5.017	-12.2995
730	1700.0	10.193	13.200	11. 67	12.359	9.190	14.84	120.73	4.365	-8.360	4.582	-12.3390
740	1700.0	10.115	13.161	1 .599	12.349	9.188	14.72	122.00	4.019	-8.396	4.187	-12.3781
750	1700.0	10.038	13.122	1 .532	12.339	9.186	14.61	123.33	3.705	-8.431	3.829	-12.4169
760	1700.0	9.961	13.084	1 .464	12.330	9.183	14.49	124.69	3.418	-8.466	3.503	-12.4555
770	1700.0	9.884	13.045	11.397	12.320	9.181	14.36	126.12	3.156	-8.501	3.207	-12.4939
780	1700.0	9.807	13.007	11.330	12.311	9.178	14.24	127.59	2.916	-8.535	2.938	-12.5319
790	1700.0	9.731	12.969	11.263	12.301	9.176	14.11	129.12	2.698	-8.569	2.693	-12.5698
800	1700.0	9.655	12.931	11.196	12.292	9.173	13.98	130.72	2.498	-8.602	2.470	-12.6073
820	1700.0	9.503	12.855	11.063	12.273	9.169	13.70	134.11	2.148 - 9	-8.668	2.082 -13	-12.6816
840	1700.0	9.352	12.779	10.931	12.254	9.164	13.41	137.79	1.854	-8.732	1.758	-12.7543
860	1700.0	9.053	12.630	10.669	12.216	9.155	12.78	146.17	1.398	-8.854	1.264	-12.8982
900	1700.0	8.905	12.556	10. 39	12.198	9.150	12.45	150.92	1.222	-8.913	1.076	-12.9682
920	1700.0	8.757	12.482	10.410	12.179	9.145	12.10	156.10	1.073	-8.970	9.182 -14	-13.0370
940	1700.0	8.610	12.408	10.282	12.161	9.141	11.74	161.74	9.458 -10	-9.024	7.857	-13.1047
960	1700.0	8.464	12.335	10.154	12.143	9.136	11.38	167.86	8.377	-9.077	6.742	-13.1712
980	1700.0	8.319	12.263	10.027	12.124	9.131	11.00	174.50	7.453	-9.128	5.802	-13.2364
1000	1700.0	8.175	12.191	9.901	12.106	9.127	10.63	181.67	6.661	-9.176	5.008	-13.3004

SUMMER MODEL, EXOSPHERIC TEMPERATURE = 1900° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
120	379.7	16.756	16.807	17.494	13.532		26.76	12.49	2.269 - 5	-4.644	1.923 - 8	-7.7161
125	500.7	16.455	16.596	17.216	13.405		26.46	16.88	1.607	-4.794	1.021	-7.9908
130	612.8	16.226	16.438	17.004	13.333		26.20	20.65	1.228	-4.911	6.318 - 9	-8.1994
135	716.3	16.040	16.311	16.833	13.276		25.98	24.38	9.835 - 6	-5.007	4.290	-8.3678
140	811.7	15.882	16.205	16.688	13.229		25.77	27.89	8.121	-5.090	3.101	-8.5085
145	898.9	15.746	16.115	16.564	13.190		25.58	31.17	6.856	-5.164	2.346	-8.6298
150	978.9	15.626	16.036	16.454	13.157		25.39	34.24	5.884	-5.230	1.836	-8.7362
155	1051.6	15.518	15.967	16.355	13.128		25.22	37.10	5.114 - 6	-5.291	1.475 - 9	-8.8311
160	1118.2	15.419	15.904	16.266	13.103		25.05	39.77	4.491	-5.348	1.210	-8.9172
165	1178.3	15.329	15.847	16.184	13.080		24.89	42.25	3.975	-5.401	1.010	-8.9957
170	1233.7	15.244	15.795	16.107	13.060		24.73	44.58	3.543	-5.451	8.543 -10	-9.0688
175	1284.1	15.165	15.747	16.036	13.041		24.58	46.76	3.176	-5.498	7.311	-9.1360
180	1330.5	15.091	15.702	15.968	13.024		24.43	48.83	2.860	-5.544	6.316	-9.1995
185	1372.6	15.020	15.660	15.905	13.009		24.28	50.75	2.587	-5.587	5.504	-9.2593
190	1411.5	14.952	15.620	15.844	12.994		24.14	52.59	2.348	-5.629	4.830	-9.3161
195	1446.8	14.887	15.582	15.786	12.981		23.99	54.31	2.139	-5.670	4.266	-9.3700
200	1479.5	14.825	15.546	15.730	12.968		23.85	55.95	1.953	-5.709	3.788	-9.4216
205	1509.5	14.765	15.511	15.676	12.956		23.71	57.50	1.788 - 6	-5.748	3.379 -10	-9.4712
210	1536.8	14.706	15.478	15.624	12.945		23.58	58.98	1.641	-5.785	3.028	-9.5189
215	1562.0	14.650	15.447	15.574	12.935		23.44	60.39	1.509	-5.821	2.724	-9.5647
220	1584.9	14.595	15.416	15.525	12.925		23.30	61.72	1.391	-5.857	2.460	-9.6091
225	1606.1	14.541	15.386	15.477	12.915		23.17	63.01	1.284	-5.892	2.227	-9.6522
230	1625.5	14.489	15.357	15.431	12.906		23.04	64.23	1.187	-5.926	2.023	-9.6941
235	1643.0	14.437	15.329	15.385	12.897		22.90	65.40	1.099	-5.959	1.842	-9.7347
240	1658.6	14.387	15.302	15.341	12.889		22.77	66.50	1.018	-5.992	1.682	-9.7742
245	1673.3	14.338	15.275	15.297	12.881		22.64	67.58	9.451 - 7	-6.025	1.538	-9.8130
250	1686.8	14.289	15.249	15.254	12.873		22.51	68.61	8.782	-6.056	1.410	-9.8508
255	1697.7	14.241	15.224	15.212	12.866		22.39	69.56	8.169 - 7	-6.088	1.296 -10	-9.8875
260	1712.4	14.193	15.198	15.169	12.858		22.26	70.67	7.607	-6.119	1.189	-9.9247
265	1726.0	14.146	15.173	15.127	12.850		22.13	71.74	7.091	-6.149	1.094	-9.9611
270	1738.6	14.099	15.148	15.086	12.843		22.01	72.79	6.617	-6.179	1.007	-9.9968
275	1750.3	14.053	15.123	15.045	12.835		21.89	73.80	6.181	-6.209	9.295 -11	-10.0317
280	1761.2	14.007	15.099	15.005	12.828		21.76	74.79	5.779	-6.238	8.588	-10.0661
285	1771.2	13.962	15.076	14.965	12.822		21.64	75.75	5.407	-6.267	7.946	-10.0999
290	1780.6	13.918	15.052	14.926	12.815		21.52	76.69	5.064	-6.296	7.362	-10.1330
295	1789.2	13.874	15.029	14.887	12.808		21.40	77.61	4.746	-6.324	6.829	-10.1657
300	1797.3	13.830	15.006	14.849	12.802		21.29	78.50	4.452	-6.351	6.341	-10.1978
310	1811.6	13.744	14.961	14.773	12.789		21.05	80.24	3.925 - 7	-6.406	5.486 -11	-10.2607
320	1824.0	13.669	14.918	14.698	12.777		20.83	81.91	3.469	-6.460	4.765	-10.3219
330	1834.6	13.576	14.874	14.625	12.766		20.61	83.52	3.074	-6.512	4.154	-10.3816
340	1843.8	13.493	14.832	14.552	12.754		20.39	85.07	2.730	-6.564	3.632	-10.4398
350	1851.6	13.411	14.790	14.480	12.743		20.18	86.58	2.430	-6.614	3.186	-10.4967
360	1858.4	13.330	14.749	14.409	12.732		19.98	88.05	2.167	-6.664	2.802	-10.5525
370	1864.2	13.250	14.708	14.339	12.721		19.78	89.48	1.936	-6.713	2.471	-10.6071
380	1869.2	13.171	14.668	14.269	12.711		19.59	90.87	1.733	-6.761	2.184	-10.6607
390	1873.5	13.092	14.628	14.200	12.701		19.40	92.23	1.554	-6.809	1.935	-10.7133
400	1877.2	13.014	14.589	14.132	12.690		19.22	93.57	1.395	-6.855	1.718	-10.7650

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
410	1880.4	12.936	14.549	14.063	12.680		19.04	94.87	1.255 - 7	-6.901	1.52[illegible] -11	-10.8158
420	1883.1	12.858	14.510	1[illegible].996	12.670		18.87	96.15	1.130	-6.947	1.362	-10.8658
430	1885.5	12.781	14.472	13.928	12.660		18.71	97.41	1.019	-6.992	1.216	-10.9150
440	1887.5	12.705	14.433	13.861	12.651		18.55	98.64	9.203 - 8	-7.036	1.088	-10.9635
450	1889.3	12.629	14.395	13.794	12.641		18.39	99.85	8.321	-7.080	9.743 -12	-11.0113
460	1890.8	12.553	14.357	13.728	12.631		18.24	101.05	7.532	-7.123	8.741	-11.0584
470	1892.1	12.477	14.319	13.662	12.622		18.10	102.22	6.826	-7.166	7.854	-11.1049
480	1893.2	12.402	14.281	13.596	12.612		17.96	103.37	6.194	-7.208	7.067	-11.1507
490	1894.1	12.327	14.243	13.530	12.603		17.83	104.51	5.626	-7.250	6.368	-11.1960
500	1894.9	12.252	14.206	13.465	12.593	9.077	17.70	105.63	5.115	-7.291	5.745	-11.2407
510	1895.7	12.178	14.169	13.400	12.584	9.075	17.57	106.73	4.655 - 8	-7.332	5.190 -12	-11.2849
520	1896.3	12.104	14.132	13.335	12.574	9.072	17.45	107.83	4.241	-7.373	4.694	-11.3285
530	1896.8	12.030	14.095	13.270	12.565	9.070	17.33	108.90	3.867	-7.413	4.250	-11.3716
540	1897.2	11.956	14.058	13.205	12.556	9.067	17.22	109.97	3.529	-7.452	3.852	-11.4143
550	1897.6	11.883	14.021	13.141	12.547	9.065	17.11	111.03	3.224	-7.492	3.496	-11.4565
560	1898.0	11.810	13.984	13.077	12.537	9.063	17.00	112.07	2.948	-7.531	3.175	-11.4982
570	1898.2	11.737	13.948	13.013	12.528	9.060	16.89	113.11	2.697	-7.569	2.887	-11.5395
580	1898.5	11.664	13.911	12.950	12.519	9.058	16.79	114.14	2.470	-7.607	2.628	-11.5805
590	1898.7	11.592	13.875	12.886	12.510	9.056	16.69	115.17	2.264	-7.645	2.393	-11.6210
600	1898.9	11.520	13.839	12.823	12.501	9.053	16.60	116.19	2.076	-7.683	2.182	-11.6611
610	1899.0	11.448	13.803	12.760	12.492	9.051	16.50	117.21	1.906 - 8	-7.720	1.991 -12	-11.7009
620	1899.2	11.376	13.767	12.697	12.483	9.049	16.41	118.23	1.750	-7.757	1.819	-11.7403
630	1899.3	11.304	13.731	12.635	12.474	9.046	16.31	119.24	1.609	-7.793	1.662	-11.7793
640	1899.4	11.233	13.696	12.572	12.465	9.044	16.22	120.27	1.480	-7.830	1.520	-11.8180
650	1899.5	11.162	13.660	12.510	12.456	9.042	16.13	121.29	1.362	-7.866	1.392	-11.8564
660	1899.5	11.091	13.625	12.448	12.447	9.040	16.04	122.32	1.255	-7.901	1.275	-11.8945
670	1899.6	11.020	13.589	12.386	12.438	9.037	15.95	123.36	1.157	-7.937	1.169	-11.9323
680	1899.7	10.950	13.554	12.324	12.430	9.035	15.86	124.41	1.067	-7.972	1.072	-11.9698
690	1899.7	10.879	13.519	12.[illegible]62	12.421	9.033	15.77	125.47	9.852 - 9	-8.006	9.839 -13	-12.0070
700	1899.8	10.809	13.484	12.201	12.412	9.031	15.69	126.54	9.100	-8.041	9.037	-12.0440
710	1899.8	10.739	13.449	12.140	12.403	9.028	15.60	127.63	8.411 - 9	-8.075	8.305 -13	-12.0806
720	1899.8	10.670	13.414	12.079	12.395	9.026	15.51	128.74	7.780	-8.109	7.638	-12.1170
730	1899.8	10.600	13.379	12.[illegible]18	12.386	9.024	15.42	129.86	7.201	-8.143	7.028	-12.1537
740	1899.9	10.531	13.345	11.[illegible]57	12.377	9.022	15.32	131.01	6.670	-8.176	6.470	-12.1891
750	1899.9	10.462	13.310	11.397	12.369	9.020	15.23	132.18	6.182	-8.209	5.[illegible]60	-12.2247
760	1899.9	10.393	13.275	11.836	12.360	9.018	15.14	133.38	5.733	-8.242	5.494	-12.2601
770	1899.9	10.324	13.241	11.776	12.351	9.015	15.04	134.61	5.321	-8.274	5.066	-12.2953
780	1899.9	10.255	13.207	11.716	12.343	9.013	14.94	135.87	4.942	-8.306	4.675	-12.3302
790	1899.9	10.187	13.173	11.656	12.334	9.011	14.84	137.16	4.593	-8.338	4.316	-12.3649
800	1899.9	10.119	13.139	11.597	12.326	9.009	14.74	138.49	4.271	-8.369	3.986	-12.3994
820	1900.0	9.983	13.071	11.478	12.309	9.005	14.53	141.26	3.702 - 9	-8.432	3.406 -13	-12.4677
840	1900.0	9.848	13.003	11.360	12.292	9.000	14.32	144.21	3.218	-8.492	2.916	-12.5351
880	1900.0	9.580	12.869	11.125	12.258	8.992	13.85	150.73	2.453	-8.610	2.151	-12.6674
900	1900.0	9.448	12.803	11.009	12.242	8.988	13.60	154.35	2.152	-8.667	1.852	-12.7323
920	1900.0	9.316	12.737	10.893	12.225	8.984	13.34	158.23	1.893	-8.723	1.599	-12.7962
940	1900.0	9.184	12.671	10.778	12.209	8.979	13.07	162.41	1.671	-8.777	1.382	-12.8594
960	1900.0	9.054	12.606	10.664	12.192	8.975	12.79	166.91	1.480	-8.830	1.198	-12.9216
980	1900.0	8.924	12.541	10.550	12.176	8.971	12.49	171.75	1.315	-8.881	1.040	-12.9830
1000	1900.0	8.795	12.476	10.437	12.160	8.967	12.19	176.96	1.172	-8.931	9.049 -14	-13.0434

SUMMER MODEL, EXOSPHERIC TEMPERATURE = 2100° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_3)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
120	379.6	16.757	16.807	17.495	13.502		26.76	12.48	2.272 - 5	-4.644	1.927 - 8	-7.7157
125	501.4	16.456	16.596	17.216	13.405		26.46	16.70	1.610	-4.793	1.022	-7.9906
130	615.2	16.226	16.436	17.004	13.332		26.21	20.72	1.231	-4.910	6.309 - 9	-8.2000
135	721.4	16.039	16.308	16.831	13.274		25.98	24.55	9.869 - 6	-5.006	4.275	-8.3690
140	819.9	15.881	16.202	16.687	13.227		25.78	28.17	8.163	-5.088	3.087	-8.5105
145	910.6	15.745	16.111	16.562	13.188		25.59	31.57	6.904	-5.161	2.333	-8.6321
150	994.6	15.624	16.031	16.451	13.154		25.41	34.77	5.938	-5.226	1.824	-8.7389
155	1071.4	15.516	15.961	16.353	13.124		25.24	37.77	5.173 - 6	-5.286	1.466 - 9	-8.8340
160	1142.6	15.418	15.898	16.263	13.098		25.07	40.61	4.553	-5.342	1.202	-8.9202
165	1207.9	15.327	15.841	16.181	13.075		24.92	43.26	4.042	-5.393	1.003	-8.9988
170	1268.4	15.243	15.788	16.105	13.054		24.76	45.78	3.612	-5.442	8.482 -10	-9.0715
175	1323.8	15.165	15.740	16.034	13.035		24.61	48.14	3.248	-5.488	7.263	-9.1389
180	1375.3	15.091	15.694	15.967	13.017		24.47	50.39	2.934	-5.533	6.279	-9.2021
185	1422.7	15.021	15.652	15.904	13.001		24.33	52.51	2.663	-5.575	5.476	-9.2616
190	1466.7	14.954	15.612	15.844	12.986		24.19	54.53	2.425	-5.615	4.810	-9.3178
195	1507.2	14.890	15.574	15.786	12.972		24.05	56.44	2.216	-5.654	4.253	-9.3713
200	1544.8	14.829	15.538	15.731	12.959		23.92	58.26	2.031	-5.692	3.782	-9.4221
205	1579.7	14.770	15.504	15.679	12.947		23.78	60.00	1.866 - 6	-5.729	3.380 -10	-9.4711
210	1611.8	14.713	15.471	15.628	12.936		23.65	61.65	1.719	-5.765	3.036	-9.5179
215	1641.8	14.658	15.440	15.578	12.925		23.52	63.24	1.587	-5.799	2.735	-9.5631
220	1669.4	14.605	15.409	15.531	12.915		23.40	64.76	1.468	-5.833	2.474	-9.6066
225	1695.1	14.552	15.380	15.484	12.905		23.27	66.21	1.360	-5.867	2.245	-9.6488
230	1718.8	14.502	15.351	15.439	12.896		23.14	67.61	1.262	-5.899	2.044	-9.6896
235	1740.8	14.452	15.324	15.395	12.887		23.02	68.95	1.173	-5.931	1.865	-9.7293
240	1761.0	14.404	15.297	15.352	12.878		22.90	70.23	1.091	-5.962	1.707	-9.7678
245	1779.6	14.356	15.271	15.310	12.870		22.77	71.46	1.017	-5.993	1.566	-9.8053
250	1796.5	14.309	15.246	15.268	12.862		22.65	72.63	9.489 - 7	-6.023	1.439	-9.8419
255	1811.9	14.264	15.221	15.228	12.854		22.53	73.76	8.863 - 7	-6.052	1.326 -10	-9.8776
260	1830.5	14.218	15.196	15.187	12.847		22.41	75.02	8.287	-6.082	1.220	-9.9135
265	1847.9	14.173	15.171	15.147	12.839		22.30	76.25	7.757	-6.110	1.126	-9.9486
270	1864.2	14.128	15.147	15.107	12.831		22.18	77.44	7.268	-6.139	1.040	-9.9830
275	1879.4	14.084	15.123	15.069	12.824		22.06	78.60	6.817	-6.166	9.625 -11	-10.0166
280	1893.6	14.041	15.100	15.030	12.817		21.95	79.73	6.400	-6.194	8.922	-10.0495
285	1907.0	13.999	15.077	14.993	12.810		21.84	80.83	6.013	-6.221	8.282	-10.0819
290	1919.4	13.956	15.055	14.956	12.804		21.72	81.90	5.655	-6.248	7.698	-10.1136
295	1931.1	13.915	15.033	14.919	12.797		21.61	82.94	5.322	-6.274	7.165	-10.1448
300	1942.0	13.874	15.011	14.883	12.791		21.50	83.96	5.013	-6.300	6.676	-10.1755
310	1961.7	13.793	14.968	14.811	12.779		21.29	85.93	4.456 - 7	-6.351	5.816 -11	-10.2354
320	1979.0	13.714	14.927	14.741	12.767		21.08	87.82	3.972	-6.401	5.088	-10.2935
330	1994.1	13.636	14.886	14.673	12.755		20.87	89.64	3.548	-6.450	4.467	-10.3500
340	2007.3	13.559	14.846	14.605	12.744		20.67	91.39	3.177	-6.498	3.935	-10.4051
350	2018.9	13.483	14.807	14.539	12.734		20.47	93.08	2.851	-6.545	3.477	-10.4588
360	2029.0	13.408	14.769	14.473	12.723		20.28	94.71	2.563	-6.591	3.081	-10.5114
370	2037.9	13.334	14.731	14.408	12.713		20.09	96.30	2.308	-6.637	2.737	-10.5628
380	2045.7	13.261	14.693	14.344	12.703		19.91	97.85	2.082	-6.681	2.437	-10.6131
390	2052.4	13.189	14.656	14.280	12.693		19.73	99.36	1.881	-6.726	2.175	-10.6625
400	2058.4	13.117	14.620	14.217	12.684		19.55	100.83	1.703	-6.769	1.945	-10.7110

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
410	2063.6	13.045	14.583	14.154	12.674		19.39	102.27	1.543 - 7	-6.812	1.743 -11	-10.7586
420	2068.1	12.974	14.548	14.092	12.665		19.22	103.68	1.400	-6.854	1.565	-10.8055
430	2072.1	12.904	14.512	14.030	12.656		19.06	105.06	1.272	-6.895	1.408	-10.8515
440	2075.6	12.834	14.477	13.969	12.646		18.91	106.41	1.157	-6.937	1.268	-10.8969
450	2078.6	12.765	14.441	13.908	12.637		18.76	107.74	1.054	-6.977	1.144	-10.9415
460	2081.3	12.695	14.407	13.847	12.628		18.61	109.04	9.613 - 8	-7.017	1.034	-10.9856
470	2083.6	12.626	14.372	13.787	12.620		18.47	110.32	8.776	-7.057	9.355 -12	-11.0290
480	2085.7	12.558	14.337	13.727	12.611		18.33	111.58	8.019	-7.096	8.477	-11.0719
490	2087.5	12.490	14.303	13.667	12.602		18.20	112.83	7.336	-7.135	7.691	-11.1140
500	2089.0	12.422	14.269	13.608	12.593	8.945	18.07	114.05	6.717	-7.173	6.987	-11.1557
510	2090.4	12.354	14.235	13.548	12.585	8.943	17.94	115.25	6.156 - 8	-7.211	6.355 -12	-11.1969
520	2091.6	12.287	14.201	13.489	12.576	8.941	17.82	116.44	5.647	-7.248	5.787	-11.2376
530	2092.7	12.220	14.168	13.431	12.568	8.938	17.70	117.62	5.184	-7.285	5.275	-11.2778
540	2093.6	12.153	14.134	13.372	12.559	8.936	17.59	118.78	4.764	-7.322	4.814	-11.3175
550	2094.4	12.087	14.101	13.314	12.551	8.934	17.48	119.92	4.381	-7.358	4.398	-11.3568
560	2095.1	12.020	14.068	13.256	12.543	8.931	17.37	121.05	4.032	-7.394	4.021	-11.3957
570	2095.7	11.954	14.035	13.198	12.534	8.929	17.27	122.18	3.714	-7.430	3.680	-11.4341
580	2096.2	11.888	14.002	13.140	12.526	8.927	17.17	123.29	3.423	-7.466	3.371	-11.4722
590	2096.7	11.823	13.969	13.083	12.518	8.925	17.07	124.39	3.158	-7.501	3.091	-11.5099
600	2097.1	11.757	13.936	13.025	12.510	8.923	16.97	125.48	2.915	-7.535	2.837	-11.5472
610	2097.5	11.692	13.903	12.968	12.501	8.921	16.88	126.57	2.692 - 8	-7.570	2.605 -12	-11.5841
620	2097.9	11.627	13.871	12.911	12.493	8.919	16.78	127.65	2.489	-7.604	2.395	-11.6207
630	2098.1	11.562	13.838	12.855	12.485	8.916	16.69	128.73	2.302	-7.638	2.203	-11.6571
640	2098.3	11.497	13.806	12.798	12.477	8.914	16.60	129.80	2.131	-7.672	2.028	-11.6931
650	2098.5	11.433	13.774	12.742	12.469	8.912	16.52	130.87	1.973	-7.705	1.868	-11.7288
660	2098.7	11.369	13.742	12.685	12.461	8.910	16.43	131.94	1.829	-7.738	1.722	-11.7642
670	2098.9	11.305	13.709	12.629	12.453	8.908	16.35	133.01	1.696	-7.771	1.588	-11.7990
680	2099.0	11.241	13.678	12.573	12.445	8.906	16.26	134.08	1.573	-7.803	1.466	-11.8338
690	2099.1	11.177	13.646	12.518	12.437	8.904	16.18	135.16	1.461	-7.835	1.354	-11.8683
700	2099.2	11.114	13.614	12.462	12.429	8.902	16.10	136.24	1.357	-7.867	1.252	-11.9025
710	2099.3	11.050	13.582	12.407	12.421	8.900	16.02	137.32	1.261 - 8	-7.899	1.157 -12	-11.9365
720	2099.4	10.987	13.551	12.351	12.413	8.898	15.94	138.42	1.173	-7.931	1.071	-11.9702
730	2099.5	10.924	13.519	12.296	12.405	8.896	15.86	139.52	1.092	-7.962	9.915 -13	-12.0037
740	2099.6	10.862	13.488	12.241	12.397	8.894	15.78	140.64	1.016	-7.993	9.185	-12.0369
750	2099.6	10.799	13.457	12.187	12.389	8.892	15.69	141.76	9.469 - 9	-8.024	8.513	-12.0699
760	2099.7	10.737	13.425	12.132	12.382	8.890	15.61	142.90	8.826	-8.054	7.894	-12.1027
770	2099.7	10.675	13.394	12.078	12.374	8.888	15.53	144.06	8.232	-8.084	7.324	-12.1352
780	2099.7	10.613	13.363	12.023	12.366	8.886	15.45	145.23	7.682	-8.115	6.799	-12.1676
790	2099.8	10.551	13.332	11.969	12.358	8.884	15.37	146.42	7.173	-8.144	6.314	-12.1997
800	2099.8	10.489	13.302	11.915	12.351	8.882	15.28	147.64	6.701	-8.174	5.867	-12.2316
820	2099.8	10.366	13.240	11.808	12.335	8.878	15.11	150.14	5.859 - 9	-8.232	5.072 -13	-12.2948
840	2099.9	10.244	13.179	11.701	12.320	8.875	14.94	152.74	5.134	-8.290	4.393	-12.3572
860	2099.9	10.002	13.058	11.489	12.290	8.867	14.57	158.33	3.969	-8.401	3.313	-12.4797
900	2099.9	9.882	12.999	11.383	12.275	8.863	14.38	161.35	3.502	-8.456	2.885	-12.5399
920	2100.0	9.762	12.938	11.279	12.260	8.959	14.18	164.54	3.098	-8.509	2.536	-12.5993
940	2100.0	9.643	12.879	11.175	12.245	8.856	13.97	167.92	2.747	-8.561	2.198	-12.6580
960	2100.0	9.525	12.820	11.071	12.230	8.852	13.75	171.51	2.441	-8.612	1.923	-12.7160
980	2100.0	9.408	12.761	10.969	12.215	8.848	13.53	175.33	2.175	-8.662	1.685	-12.7733
1000	2100.0	9.291	12.702	10.866	12.201	8.845	13.29	179.39	1.943	-8.711	1.480	-12.8299

BLANK PAGE

Part 6.3

120 km to 1000 km

Spring/Fall Models

TEMPERATURE, PRESSURE, DENSITY, SCALE HEIGHT, MOLECULAR WEIGHT, AND NUMBER DENSITIES

Metric Units

SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 600° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
120	355.0	16.875	16.881	17.602	13.531		26.90	11.62	2.700 - 5	-4.569	2.461 - 8	-7.6089
125	387.1	16.625	16.737	17.378	13.482		26.56	12.85	1.794	-4.746	1.481	-7.8296
130	415.0	16.398	16.609	17.176	13.438		26.21	13.98	1.236	-4.908	9.389 - 9	-8.0274
135	439.3	16.190	16.492	16.991	13.400		25.85	15.02	8.755 - 6	-5.058	6.198	-8.2078
140	460.3	15.995	16.384	16.817	13.366		25.49	16.00	6.343	-5.198	4.223	-8.3743
145	478.6	15.811	16.284	16.654	13.334		25.11	16.91	4.681	-5.330	2.953	-8.5297
150	494.6	15.636	16.189	16.499	13.305		24.72	17.77	3.508	-5.455	2.109	-8.6759
155	508.4	15.468	16.099	16.351	13.278		24.33	18.59	2.665 - 6	-5.574	1.534 - 9	-8.8142
160	520.4	15.306	16.013	16.208	13.253		23.93	19.38	2.048	-5.689	1.133	-8.9460
165	530.8	15.149	15.931	16.070	13.229		23.53	20.13	1.590	-5.799	8.475 -10	-9.0719
170	539.9	14.997	15.851	15.935	13.206		23.13	20.87	1.246	-5.905	6.417	-9.1927
175	547.8	14.848	15.773	15.804	13.185		22.72	21.58	9.841 - 7	-6.007	4.910	-9.3089
180	554.6	14.702	15.697	15.675	13.164		22.32	22.27	7.835	-6.106	3.793	-9.4211
185	560.6	14.558	15.623	15.549	13.143		21.93	22.96	6.281	-6.202	2.955	-9.5295
190	565.7	14.417	15.550	15.425	13.124		21.54	23.62	5.067	-6.295	2.320	-9.6345
195	570.2	14.277	15.479	15.302	13.105		21.16	24.27	4.112	-6.386	1.835	-9.7362
200	574.1	14.140	15.409	15.181	13.086		20.79	24.91	3.356	-6.474	1.461	-9.8352
205	577.5	14.004	15.339	15.062	13.068		20.43	25.54	2.753 - 7	-6.560	1.171 -10	-9.9314
210	580.5	13.869	15.271	14.943	13.050		20.08	26.15	2.268	-6.644	9.439 -11	-10.0251
215	583.0	13.735	15.203	14.826	13.032		19.75	26.75	1.878	-6.726	7.651	-10.1163
220	585.3	13.602	15.136	14.710	13.015		19.44	27.33	1.561	-6.807	6.234	-10.2053
225	587.2	13.470	15.069	14.594	12.997		19.13	27.89	1.302	-6.885	5.104	-10.2921
230	588.9	13.339	15.003	14.479	12.980		18.85	28.44	1.090	-6.962	4.198	-10.3770
235	590.3	13.208	14.937	14.365	12.964		18.58	28.97	9.161 - 8	-7.038	3.467	-10.4600
240	591.6	13.079	14.872	14.251	12.947		18.32	29.48	7.720	-7.112	2.876	-10.5413
245	592.7	12.949	14.807	14.138	12.930		18.08	29.98	6.525	-7.185	2.394	-10.6209
250	593.7	12.821	14.742	14.025	12.914		17.85	30.46	5.530	-7.257	2.000	-10.6990
255	594.5	12.692	14.678	13.913	12.897		17.63	30.92	4.699 - 8	-7.328	1.676 -11	-10.7756
260	595.2	12.565	14.613	13.801	12.881		17.43	31.37	4.002	-7.398	1.409	-10.8509
265	595.8	12.437	14.549	13.689	12.865		17.23	31.81	3.416	-7.466	1.188	-10.9250
270	596.4	12.310	14.486	13.578	12.849		17.05	32.23	2.922	-7.534	1.005	-10.9979
275	596.9	12.184	14.422	13.467	12.833		16.87	32.64	2.505	-7.601	8.517 -12	-11.0697
280	597.3	12.057	14.359	13.356	12.817		16.70	33.05	2.151	-7.667	7.235	-11.1406
285	597.6	11.931	14.296	13.246	12.801		16.54	33.45	1.851	-7.733	6.160	-11.2104
290	597.9	11.806	14.233	13.136	12.785		16.37	33.85	1.595	-7.797	5.255	-11.2794
295	598.2	11.680	14.170	13.026	12.770		16.22	34.25	1.377	-7.861	4.491	-11.3476
300	598.4	11.555	14.107	12.916	12.754		16.06	34.65	1.191	-7.924	3.845	-11.4151
310	598.8	11.305	13.982	12.698	12.722		15.74	35.47	8.957 - 9	-8.048	2.832 -12	-11.5479
320	599.1	11.057	13.858	12.480	12.691		15.41	36.35	6.780	-8.169	2.098	-11.6782
330	599.3	10.809	13.734	12.263	12.660		15.06	37.33	5.168	-8.287	1.562	-11.8063
340	599.5	10.562	13.611	12.047	12.629		14.68	38.43	3.968	-8.401	1.169	-11.9323
350	599.6	10.316	13.488	11.832	12.598		14.25	39.70	3.072	-8.513	8.781 -13	-12.0564
360	599.7	10.071	13.365	11.617	12.568		13.78	41.21	2.399	-8.620	6.627	-12.1787
370	599.8	9.826	13.243	11.403	12.537		13.24	43.00	1.891	-8.723	5.022	-12.2991
380	599.8	9.583	13.121	11.190	12.507		12.65	45.15	1.507	-8.822	3.822	-12.4177
390	599.9	9.340	12.999	10.977	12.476		12.00	47.75	1.215	-8.915	2.923	-12.5342
400	599.9	9.097	12.878	10.765	12.446		11.30	50.86	9.915 -10	-9.004	2.246	-12.6486

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
410	599.9	8.856	12.757	10.553	12.416		10.55	54.61	8.200 -10	-9.086	1.735 -13	-12.7607
420	599.9	8.615	12.637	10.343	12.386		9.79	50.08	6.876	-9.163	1.349	-12.8701
430	600.0	8.375	12.517	10.132	12.355		9.01	64.38	5.846	-9.233	1.055	-12.9766
440	600.0	8.136	12.397	9.923	12.326		8.24	70.59	5.039	-9.298	8.322 -14	-13.0798
450	600.0	7.897	12.278	9.714	12.296		7.50	77.80	4.403	-9.356	6.616	-13.1794
460	600.0	7.659	12.159	9.506	12.266		6.80	86.06	3.876	-9.409	5.308	-13.2753
470	600.0	7.422	12.040	9.298	12.236		6.15	95.36	3.488	-9.457	4.302	-13.3663
480	600.0	7.186	11.922	9.091	12.207		5.57	105.68	3.158	-9.501	3.524	-13.4529
490	600.0	6.950	11.804	8.885	12.177		5.05	116.92	2.886	-9.540	2.920	-13.5346
500	600.0	6.715	11.687	8.679	12.148	12.121	4.59	128.92	2.660	-9.575	2.448	-13.6112
510	600.0	6.480	11.569	8.473	12.118	12.113	4.19	141.52	2.470 -10	-9.607	2.077 -14	-13.6826
520	600.0	6.246	11.452	8.269	12.089	12.106	3.85	154.49	2.309	-9.637	1.783	-13.7487
530	600.0	6.013	11.336	8.065	12.060	12.098	3.56	167.61	2.170	-9.664	1.549	-13.8099
540	600.0	5.781	11.220	7.861	12.031	12.091	3.31	180.67	2.049	-9.689	1.361	-13.8661
550	600.0	5.549	11.104	7.658	12.002	12.084	3.10	193.48	1.942	-9.712	1.208	-13.9179
560	600.0	5.318	10.988	7.456	11.973	12.077	2.92	205.91	1.847	-9.734	1.083	-13.9654
570	600.0	5.088	10.873	7.254	11.944	12.069	2.77	217.85	1.762	-9.754	9.793 -15	-14.0091
580	600.0	4.858	10.758	7.053	11.915	12.062	2.64	229.24	1.685	-9.773	8.925	-14.0496
590	600.0	4.629	10.644	6.853	11.887	12.055	2.53	240.06	1.615	-9.792	8.190	-14.0867
600	600.0	4.400	10.529	6.653	11.858	12.048	2.43	250.32	1.550	-9.810	7.562	-14.1213
610	600.0	4.173	10.416	6.453	11.830	12.040	2.35	260.05	1.490 -10	-9.827	7.020 -15	-14.1537
620	600.0	3.945	10.302	6.254	11.801	12.033	2.28	269.29	1.435	-9.843	6.546	-14.1840
630	600.0	3.719	10.189	6.056	11.773	12.026	2.21	278.11	1.384	-9.859	6.129	-14.2126
640	600.0	3.493	10.076	5.858	11.745	12.019	2.15	286.54	1.336	-9.874	5.758	-14.2397
650	600.0	3.268	9.963	5.661	11.717	12.012	2.10	294.66	1.290	-9.889	5.425	-14.2656
660	600.0	3.043	9.851	5.465	11.689	12.005	2.05	302.50	1.248	-9.904	5.125	-14.2903
670	600.0	2.820	9.739	5.269	11.661	11.998	2.00	310.12	1.208	-9.918	4.853	-14.3140
680	600.0	2.596	9.627	5.073	11.633	11.991	1.96	317.56	1.170	-9.932	4.603	-14.3369
690	600.0	2.374	9.516	4.878	11.605	11.984	1.92	324.85	1.134	-9.945	4.375	-14.3591
700	600.0	2.152	9.405	4.684	11.577	11.977	1.89	332.02	1.100	-9.959	4.164	-14.3805
710	600.0	1.930	9.294	4.490	11.549	11.970	1.85	339.11	1.068 -10	-9.972	3.968 -15	-14.4014
720	600.0	1.710	9.184	4.297	11.522	11.963	1.82	346.12	1.037	-9.984	3.786	-14.4218
730	600.0	1.489	9.074	4.104	11.494	11.956	1.79	353.09	1.008	-9.997	3.617	-14.4416
740	600.0	1.270	8.964	3.912	11.467	11.949	1.76	360.01	9.799 -11	-10.009	3.459	-14.4610
750	600.0	1.051	8.855	3.721	11.439	11.942	1.73	366.90	9.533	-10.021	3.312	-14.4800
760	600.0	0.833	8.746	3.529	11.412	11.935	1.71	373.78	9.279	-10.032	3.173	-14.4985
770	600.0	0.615	8.637	3.339	11.385	11.928	1.68	380.63	9.036	-10.044	3.043	-14.5167
780	600.0	0.398	8.528	3.149	11.358	11.922	1.65	387.48	8.804	-10.055	2.920	-14.5346
790	600.0	0.182	8.420	2.959	11.331	11.915	1.63	394.31	8.582	-10.066	2.805	-14.5523
800	600.0	-0.034	8.312	2.771	11.304	11.908	1.61	401.14	8.369	-10.077	2.697	-14.5698
820	600.0	-0.464	8.097	2.394	11.250	11.894	1.56	414.75	7.968 -11	-10.099	2.497 -15	-14.6028
840	600.0	-0.891	7.884	2.020	11.196	11.881	1.52	428.30	7.599	-10.119	2.319	-14.6347
860	600.0	-1.319	7.670	1.648	11.143	11.867	1.48	441.80	7.258	-10.139	2.159	-14.6655
880	600.0	-1.739	7.460	1.278	11.090	11.854	1.45	455.13	6.941	-10.159	2.015	-14.6955
900	600.0	-2.160	7.250	0.910	11.038	11.841	1.42	468.35	6.647	-10.177	1.886	-14.7245
920	600.0	-2.578	7.040	0.544	10.985	11.828	1.38	481.40	6.373	-10.196	1.769	-14.7523
940	600.0	-2.994	6.833	0.180	10.933	11.815	1.36	494.26	6.117	-10.213	1.663	-14.7792
960	600.0	-3.407	6.626	-0.182	10.882	11.802	1.33	506.88	5.877	-10.231	1.566	-14.8051
980	600.0	-3.818	6.420	-0.562	10.830	11.789	1.31	519.26	5.652	-10.248	1.479	-14.8301
1000	600.0	-4.227	6.214	-0.901	10.779	11.776	1.28	531.36	5.441	-10.264	1.399	-14.8543

SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 700° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
120	355.0	16.875	16.881	17.602	13.531		26.90	11.62	2.700 - 5	-4.569	2.461 - 8	-7.6089
125	401.3	16.613	16.723	17.366	13.472		26.57	13.32	1.808	-4.743	1.439	-7.8418
130	441.4	16.385	16.588	17.161	13.423		26.24	14.85	1.268	-4.897	9.062 - 9	-8.0428
135	476.2	16.181	16.470	16.978	13.382		25.91	16.25	9.192 - 6	-5.037	6.815	-8.2208
140	506.2	15.994	16.363	16.812	13.345		25.57	17.53	6.837	-5.165	4.154	-8.3815
145	532.3	15.822	16.266	16.658	13.313		25.24	18.70	5.188	-5.285	2.959	-8.5288
150	554.8	15.660	16.176	16.514	13.283		24.90	19.79	4.001	-5.398	2.160	-8.6655
155	574.3	15.506	16.092	16.378	13.257		24.56	20.80	3.128 - 6	-5.505	1.609 - 9	-8.7935
160	591.2	15.360	16.012	16.248	13.232		24.22	21.75	2.473	-5.607	1.218	-8.9142
165	605.8	15.219	15.937	16.123	13.209		23.88	22.64	1.974	-5.705	9.337 -10	-9.0289
170	618.4	15.083	15.864	16.003	13.188		23.53	23.49	1.589	-5.799	7.273	-9.1383
175	629.4	14.951	15.794	15.887	13.168		23.19	24.30	1.289	-5.890	5.712	-9.2432
180	638.9	14.822	15.727	15.773	13.148		22.84	25.08	1.053	-5.978	4.528	-9.3441
185	647.1	14.696	15.661	15.662	13.130		22.50	25.82	8.651 - 7	-6.063	3.618	-9.4416
190	654.2	14.573	15.597	15.553	13.112		22.16	26.55	7.147	-6.146	2.912	-9.5358
195	660.3	14.451	15.534	15.446	13.095		21.83	27.25	5.935	-6.227	2.359	-9.6272
200	665.7	14.331	15.472	15.341	13.078		21.50	27.93	4.951	-6.305	1.923	-9.7160
205	670.3	14.213	15.412	15.237	13.062		21.18	28.59	4.148 - 7	-6.382	1.576 -10	-9.8024
210	674.3	14.098	15.352	15.135	13.046		20.86	29.24	3.490	-6.457	1.299	-9.8865
215	677.7	13.980	15.293	15.033	13.030		20.56	29.87	2.947	-6.531	1.075	-9.9686
220	680.7	13.856	15.235	14.932	13.015		20.26	30.49	2.497	-6.603	8.938 -11	-10.0488
225	683.3	13.752	15.177	14.832	13.000		19.97	31.09	2.123	-6.673	7.463	-10.1271
230	685.5	13.639	15.120	14.733	12.985		19.70	31.68	1.810	-6.742	6.255	-10.2038
235	687.5	13.527	15.063	14.635	12.971		19.43	32.25	1.548	-6.810	5.263	-10.2788
240	689.2	13.415	15.007	14.537	12.956		19.18	32.81	1.327	-6.877	4.443	-10.3523
245	690.6	13.304	14.951	14.440	12.942		18.94	33.35	1.141	-6.943	3.763	-10.4244
250	691.9	13.193	14.895	14.343	12.927		18.70	33.88	9.835 - 8	-7.007	3.198	-10.4952
255	693.0	13.083	14.839	14.246	12.913		18.48	34.39	8.495 - 8	-7.071	2.725 -11	-10.5646
260	693.9	12.973	14.784	14.150	12.899		18.27	34.89	7.353	-7.134	2.329	-10.6329
265	694.7	12.864	14.729	14.054	12.885		18.07	35.37	6.378	-7.195	1.995	-10.7000
270	695.4	12.755	14.675	13.959	12.872		17.88	35.84	5.542	-7.256	1.714	-10.7660
275	696.1	12.646	14.620	13.863	12.858		17.70	36.29	4.825	-7.317	1.476	-10.8310
280	696.6	12.538	14.566	13.768	12.844		17.53	36.73	4.207	-7.376	1.273	-10.8951
285	697.0	12.430	14.512	13.674	12.830		17.36	37.15	3.675	-7.435	1.101	-10.9582
290	697.4	12.322	14.458	13.579	12.817		17.21	37.57	3.214	-7.493	9.539 -12	-11.0205
295	697.8	12.214	14.404	13.485	12.803		17.05	37.97	2.816	-7.550	8.280	-11.0820
300	698.1	12.107	14.350	13.391	12.790		16.92	38.37	2.470	-7.607	7.199	-11.1427
310	698.6	11.893	14.243	13.204	12.763		16.65	39.13	1.908 - 8	-7.719	5.469 -12	-11.2621
320	698.9	11.680	14.136	13.017	12.736		16.39	39.88	1.482	-7.829	4.179	-11.3789
330	699.2	11.467	14.030	12.831	12.709		16.15	40.62	1.156	-7.937	3.210	-11.4935
340	699.4	11.256	13.924	12.646	12.683		15.91	41.37	9.055 - 9	-8.043	2.477	-11.6060
350	699.5	11.045	13.818	12.461	12.656		15.67	42.14	7.127	-8.147	1.920	-11.7168
360	699.7	10.834	13.713	12.277	12.630		15.42	42.96	5.634	-8.249	1.493	-11.8259
370	699.7	10.625	13.608	12.094	12.604		15.15	43.84	4.474	-8.349	1.165	-11.9335
380	699.8	10.416	13.504	11.911	12.578		14.87	44.80	3.570	-8.447	9.127 -13	-12.0397
390	699.9	10.208	13.400	11.728	12.552		14.57	45.87	2.863	-8.543	7.170	-12.1445
400	699.9	10.000	13.296	11.547	12.526		14.24	47.08	2.309	-8.637	5.650	-12.2480

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
410	699.9	9.793	13.192	11.365	12.500		13.88	48.46	1.873 - 9	-8.728	4.465 -13	-12.3501
420	699.9	9.587	13.089	11.185	12.474		13.48	50.03	1.528	-8.816	3.540	-12.4510
430	700.0	9.381	12.986	11.005	12.448		13.05	51.84	1.256	-8.901	2.816	-12.5504
440	700.0	9.176	12.884	10.825	12.422		12.58	53.92	1.039	-8.983	2.247	-12.6484
450	700.0	8.971	12.781	10.646	12.397		12.08	56.32	8.668 -10	-9.062	1.799	-12.7449
460	700.0	8.767	12.680	10.467	12.371		11.55	59.07	7.288	-9.137	1.447	-12.8396
470	700.0	8.564	12.578	10.289	12.346		11.00	62.23	6.179	-9.209	1.168	-12.9326
480	700.0	8.361	12.476	10.112	12.321		10.43	65.82	5.285	-9.277	9.471 -14	-13.0236
490	700.0	8.159	12.375	9.935	12.295		9.85	69.89	4.560	-9.341	7.719	-13.1125
500	700.0	7.958	12.275	9.759	12.270	11.553	9.27	74.47	3.970	-9.401	6.324	-13.1990
510	700.0	7.757	12.174	9.593	12.245	11.547	8.70	79.58	3.486 -	-9.458	5.212 -14	-13.2830
520	700.0	7.556	12.074	9.407	12.220	11.541	8.15	85.23	3.087	-9.510	4.323	-13.3643
530	700.0	7.356	11.974	9.232	12.195	11.534	7.62	91.42	2.756	-9.560	3.609	-13.4426
540	700.0	7.157	11.874	9.058	12.170	11.528	7.12	98.11	2.480	-9.606	3.034	-13.5179
550	700.0	6.959	11.775	8.894	12.145	11.522	6.66	105.27	2.248	-9.648	2.570	-13.5900
560	700.0	6.761	11.676	8.711	12.120	11.516	6.23	112.83	2.051	-9.688	2.194	-13.6587
570	700.0	6.563	11.577	8.538	12.096	11.509	5.84	120.72	1.882	-9.725	1.888	-13.7240
580	700.0	6.366	11.479	8.365	12.071	11.503	5.49	128.84	1.737	-9.760	1.637	-13.7859
590	700.0	6.170	11.381	8.193	12.046	11.497	5.17	137.10	1.611	-9.793	1.431	-13.8443
600	700.0	5.974	11.283	8.022	12.022	11.491	4.89	145.40	1.501	-9.824	1.261	-13.8993
610	700.0	5.779	11.185	7.851	11.998	11.485	4.64	153.65	1.404 -10	-9.853	1.119 -14	-13.9511
620	700.0	5.584	11.088	7.681	11.973	11.479	4.42	161.76	1.318	-9.880	1.001	-13.9997
630	700.0	5.390	10.991	7.511	11.949	11.472	4.23	169.66	1.241	-9.906	9.007 -15	-14.0454
640	700.0	5.196	10.894	7.341	11.925	11.466	4.06	177.29	1.171	-9.931	8.160	-14.0883
650	700.0	5.003	10.798	7.172	11.901	11.460	3.91	184.62	1.108	-9.955	7.436	-14.1287
660	700.0	4.811	10.701	7.004	11.876	11.454	3.77	191.62	1.051	-9.979	6.813	-14.1667
670	700.0	4.619	10.605	6.836	11.852	11.448	3.66	198.29	9.982 -11	-10.001	6.273	-14.2026
680	700.0	4.428	10.510	6.668	11.829	11.442	3.55	204.62	9.499	-10.022	5.801	-14.2365
690	700.0	4.237	10.414	6.501	11.805	11.436	3.46	210.63	9.052	-10.043	5.385	-14.2688
700	700.0	4.047	10.319	6.335	11.781	11.430	3.38	216.35	8.638	-10.064	5.017	-14.2995
710	700.0	3.857	10.224	6.168	11.757	11.424	3.31	221.80	8.252 -11	-10.083	4.689 -15	-14.3289
720	700.0	3.668	10.130	6.003	11.733	11.418	3.24	227.00	7.893	-10.103	4.394	-14.3571
730	700.0	3.479	10.035	5.838	11.710	11.412	3.18	231.99	7.556	-10.122	4.128	-14.3843
740	700.0	3.291	9.941	5.673	11.686	11.406	3.12	236.79	7.241	-10.140	3.886	-14.4105
750	700.0	3.103	9.847	5.509	11.663	11.400	3.07	241.44	6.944	-10.158	3.666	-14.4358
760	700.0	2.916	9.754	5.345	11.639	11.395	3.02	245.96	6.665	-10.176	3.463	-14.4605
770	700.0	2.730	9.661	5.182	11.616	11.389	2.98	250.38	6.402	-10.194	3.277	-14.4845
780	700.0	2.544	9.568	5.019	11.593	11.383	2.94	254.72	6.153	-10.211	3.105	-14.5080
790	700.0	2.358	9.475	4.856	11.570	11.377	2.90	259.00	5.918	-10.228	2.945	-14.5309
800	700.0	2.173	9.382	4.694	11.547	11.371	2.86	263.24	5.696	-10.244	2.797	-14.5534
820	700.0	1.805	9.199	4.372	11.500	11.360	2.78	271.68	5.285 -11	-10.277	2.529 -15	-14.5971
840	700.0	1.438	9.015	4.051	11.455	11.348	2.72	280.15	4.916	-10.308	2.293	-14.6395
860	700.0	0.711	8.652	3.415	11.364	11.325	2.59	297.49	4.280	-10.369	1.901	-14.7210
900	700.0	0.351	8.471	3.099	11.319	11.314	2.52	306.50	4.005	-10.397	1.737	-14.7603
920	700.0	-0.007	8.292	2.786	11.274	11.302	2.46	315.77	3.756	-10.425	1.589	-14.7988
940	700.0	-0.364	8.114	2.474	11.229	11.291	2.40	325.34	3.529	-10.452	1.457	-14.8364
960	700.0	-0.718	7.937	2.163	11.185	11.280	2.35	335.23	3.321	-10.479	1.339	-14.8734
980	700.0	-1.071	7.761	1.855	11.141	11.269	2.29	345.45	3.132	-10.504	1.231	-14.9096
1000	700.0	-1.421	7.585	1.548	11.097	11.258	2.23	356.01	2.958	-10.529	1.135	-14.9450

SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 800° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
120	355.0	16.875	16.881	17.602	13.531		26.90	11.62	2.700 - 5	-4.569	2.461 - 8	-7.6089
125	415.3	16.602	16.710	17.355	13.464		26.57	13.78	1.821	-4.740	1.401	-7.8535
130	467.4	16.372	16.570	17.147	13.409		26.26	15.71	1.297	-4.887	8.785 - 9	-8.0573
135	512.4	16.172	16.450	16.967	13.365		25.95	17.46	9.594 - 6	-5.018	5.845	-8.2332
140	551.3	15.993	16.344	16.806	13.326		25.65	19.04	7.295	-5.137	4.082	-8.3891
145	585.0	15.829	16.249	16.659	13.293		25.35	20.47	5.664	-5.247	2.952	-8.5299
150	614.1	15.677	16.163	16.524	13.264		25.05	21.78	4.470	-5.350	2.193	-8.6590
155	639.3	15.535	16.083	16.397	13.237		24.75	22.98	3.575 - 6	-5.447	1.665 - 9	-8.7786
160	661.1	15.401	16.009	16.278	13.213		24.45	24.09	2.891	-5.539	1.286	-8.8907
165	679.9	15.272	15.938	16.164	13.191		24.15	25.12	2.366	-5.627	1.008	-8.9965
170	696.1	15.149	15.871	16.054	13.171		23.85	26.09	1.941	-5.712	7.998 -10	-9.0970
175	710.2	15.030	15.808	15.949	13.152		23.55	27.00	1.608	-5.794	6.412	-9.1930
180	722.4	14.914	15.746	15.847	13.133		23.25	27.86	1.340	-5.873	5.187	-9.2851
185	732.9	14.801	15.687	15.747	13.116		22.95	28.67	1.123	-5.950	4.229	-9.3738
190	742.0	14.691	15.629	15.650	13.100		22.65	29.45	9.452 - 7	-6.024	3.471	-9.4595
195	749.8	14.583	15.572	15.555	13.084		22.36	30.20	7.994	-6.097	2.867	-9.5426
200	756.6	14.477	15.517	15.462	13.069		22.07	30.93	6.787	-6.168	2.381	-9.6232
205	762.5	14.372	15.463	15.370	13.054		21.78	31.63	5.785 - 7	-6.238	1.987 -10	-9.7017
210	767.6	14.269	15.410	15.279	13.040		21.50	32.31	4.947	-6.306	1.666	-9.7782
215	772.0	14.167	15.358	15.189	13.026		21.22	32.97	4.244	-6.372	1.403	-9.8529
220	775.8	14.066	15.306	15.100	13.012		20.94	33.61	3.653	-6.437	1.186	-9.9259
225	779.0	13.965	15.255	15.012	12.999		20.68	34.24	3.152	-6.501	1.006	-9.9973
230	781.9	13.866	15.205	14.925	12.985		20.42	34.86	2.727	-6.564	8.568 -11	-10.0672
235	784.3	13.767	15.155	14.838	12.972		20.16	35.46	2.366	-6.626	7.316	-10.1358
240	786.5	13.669	15.105	14.752	12.959		19.92	36.05	2.057	-6.687	6.266	-10.2030
245	788.3	13.571	15.056	14.667	12.947		19.68	36.63	1.793	-6.746	5.383	-10.2690
250	789.9	13.474	15.007	14.582	12.934		19.45	37.19	1.566	-6.805	4.637	-10.3338
255	791.2	13.378	14.958	14.497	12.922		19.23	37.74	1.370 - 7	-6.863	4.005 -11	-10.3974
260	792.4	13.281	14.910	14.413	12.909		19.02	38.28	1.201	-6.920	3.467	-10.4601
265	793.5	13.186	14.861	14.329	12.897		18.81	38.81	1.055	-6.977	3.008	-10.5217
270	794.3	13.090	14.813	14.245	12.885		18.61	39.32	9.283 - 8	-7.032	2.616	-10.5823
275	795.1	12.995	14.766	14.161	12.873		18.43	39.82	8.181	-7.087	2.280	-10.6420
280	795.8	12.900	14.718	14.078	12.861		18.24	40.31	7.221	-7.141	1.991	-10.7009
285	796.3	12.805	14.670	13.995	12.849		18.07	40.79	6.384	-7.195	1.742	-10.7589
290	796.8	12.711	14.623	13.913	12.837		17.91	41.25	5.651	-7.248	1.527	-10.8161
295	797.3	12.616	14.576	13.830	12.825		17.75	41.70	5.009	-7.300	1.341	-10.8725
300	797.6	12.522	14.529	13.748	12.813		17.60	42.14	4.446	-7.352	1.180	-10.9282
310	798.2	12.335	14.435	13.584	12.789		17.31	43.00	3.515 - 8	-7.454	9.170 -12	-11.0376
320	798.7	12.148	14.341	13.420	12.766		17.05	43.81	2.792	-7.554	7.169	-11.1445
330	799.0	11.963	14.248	13.258	12.743		16.81	44.60	2.227	-7.652	5.634	-11.2492
340	799.3	11.777	14.156	13.095	12.719		16.58	45.36	1.783	-7.749	4.448	-11.3518
350	799.4	11.593	14.063	12.934	12.696		16.37	46.10	1.433	-7.844	3.527	-11.4526
360	799.6	11.409	13.971	12.773	12.673		16.16	46.85	1.155	-7.937	2.808	-11.5516
370	799.7	11.225	13.880	12.612	12.650		15.95	47.59	9.348 - 9	-8.029	2.243	-11.6492
380	799.8	11.043	13.788	12.452	12.627		15.75	48.36	7.589	-8.120	1.797	-11.7454
390	799.8	10.860	13.697	12.293	12.605		15.54	49.16	6.182	-8.209	1.445	-11.8403
400	799.9	10.679	13.606	12.134	12.582		15.33	50.00	5.052	-8.297	1.164	-11.9340

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
410	799.9	10.498	13.516	11.975	12.559		15.10	50.89	4.144 - 9	-8.383	9.408 -13	-12.0265
420	799.9	10.317	13.425	11.817	12.537		14.86	51.87	3.411	-8.467	7.621	-12.1180
430	799.9	10.137	13.335	11.659	12.514		14.61	52.93	2.818	-8.550	6.189	-12.2084
440	800.0	9.957	13.246	11.502	12.492		14.33	54.10	2.338	-8.631	5.037	-12.2978
450	800.0	9.778	13.156	11.345	12.469		14.04	55.40	1.947	-8.711	4.110	-12.3862
460	800.0	9.600	13.067	11.189	12.447		13.72	56.85	1.629	-8.788	3.361	-12.4735
470	800.0	9.422	12.978	11.033	12.425		13.38	58.47	1.370	-8.863	2.755	-12.5598
480	800.0	9.245	12.889	10.878	12.402		13.01	60.29	1.158	-8.936	2.264	-12.6450
490	800.0	9.068	12.801	10.723	12.380		12.62	62.33	9.833 -10	-9.007	1.866	-12.7291
500	800.0	8.892	12.713	10.569	12.358	11.102	12.21	64.62	8.399	-9.076	1.542	-12.8119
510	800.0	8.716	12.625	10.415	12.336	11.096	11.78	67.19	7.216 -10	-9.142	1.278 -13	-12.8935
520	800.0	8.540	12.537	10.261	12.314	11.091	11.33	70.05	6.237	-9.205	1.063	-12.9736
530	800.0	8.366	12.450	10.108	12.292	11.085	10.87	73.23	5.424	-9.266	8.864 -14	-13.0523
540	800.0	8.191	12.362	9.956	12.271	11.080	10.40	76.76	4.746	-9.324	7.422	-13.1295
550	800.0	8.017	12.276	9.804	12.249	11.074	9.93	80.65	4.180	-9.379	6.239	-13.2049
560	800.0	7.844	12.189	9.652	12.227	11.069	9.46	84.92	3.704	-9.431	5.266	-13.2785
570	800.0	7.671	12.102	9.501	12.206	11.063	8.99	89.56	3.303	-9.481	4.465	-13.3502
580	800.0	7.499	12.016	9.350	12.184	11.058	8.54	94.59	2.963	-9.528	3.803	-13.4199
590	800.0	7.327	11.930	9.199	12.163	11.053	8.10	99.98	2.673	-9.573	3.256	-13.4873
600	800.0	7.156	11.845	9.049	12.141	11.047	7.68	105.72	2.425	-9.615	2.802	-13.5526
610	800.0	6.985	11.759	8.900	12.120	11.042	7.29	111.77	2.212 -10	-9.655	2.424 -14	-13.6155
620	800.0	6.815	11.674	8.751	12.098	11.036	6.92	118.09	2.028	-9.693	2.109	-13.6759
630	800.0	6.645	11.589	8.602	12.077	11.031	6.57	124.64	1.867	-9.729	1.845	-13.7335
640	800.0	6.475	11.505	8.454	12.056	11.026	6.26	131.35	1.727	-9.763	1.624	-13.7894
650	800.0	6.307	11.420	8.306	12.035	11.020	5.96	138.17	1.603	-9.795	1.438	-13.8424
660	800.0	6.138	11.336	8.158	12.014	11.015	5.70	145.03	1.494	-9.826	1.280	-13.8929
670	800.0	5.970	11.252	8.011	11.993	11.010	5.46	151.87	1.397	-9.855	1.146	-13.9409
680	800.0	5.803	11.168	7.865	11.972	11.005	5.24	158.63	1.309	-9.883	1.031	-13.9865
690	800.0	5.636	11.085	7.719	11.951	10.999	5.04	165.25	1.231	-9.910	9.335 -15	-14.0299
700	800.0	5.469	11.002	7.573	11.930	10.994	4.87	171.69	1.160	-9.936	8.491	-14.0710
710	800.0	5.303	10.919	7.428	11.909	10.989	4.71	177.91	1.096 -10	-9.960	7.761 -15	-14.1101
720	800.0	5.138	10.836	7.283	11.889	10.984	4.57	183.88	1.037	-9.984	7.125	-14.1472
730	800.0	4.973	10.753	7.138	11.868	10.978	4.45	189.58	9.826 -11	-10.008	6.569	-14.1825
740	800.0	4.808	10.671	6.994	11.847	10.973	4.34	195.00	9.328	-10.030	6.080	-14.2161
750	800.0	4.644	10.589	6.850	11.827	10.968	4.24	200.13	8.868	-10.052	5.648	-14.2481
760	800.0	4.480	10.507	6.707	11.806	10.963	4.15	204.98	8.441	-10.074	5.263	-14.2788
770	800.0	4.317	10.425	6.564	11.786	10.958	4.07	209.56	8.043	-10.095	4.920	-14.3081
780	800.0	4.154	10.344	6.422	11.766	10.953	4.00	213.87	7.672	-10.115	4.611	-14.3362
790	800.0	3.992	10.263	6.280	11.745	10.948	3.93	217.94	7.325	-10.135	4.332	-14.3633
800	800.0	3.830	10.182	6.138	11.725	10.942	3.88	221.77	6.999	-10.155	4.079	-14.3894
820	800.0	3.508	10.021	5.856	11.685	10.932	3.78	228.85	6.405 -11	-10.193	3.638 -15	-14.4392
840	800.0	3.187	9.860	5.575	11.645	10.922	3.70	235.24	5.876	-10.231	3.265	-14.4861
860	800.0	2.551	9.542	5.018	11.565	10.902	3.57	246.57	4.977	-10.303	2.668	-14.5738
900	800.0	2.236	9.385	4.742	11.526	10.892	3.51	251.77	4.596	-10.338	2.425	-14.6154
920	800.0	1.922	9.228	4.468	11.486	10.882	3.46	256.78	4.246	-10.372	2.210	-14.6557
940	800.0	1.610	9.072	4.195	11.447	10.873	3.42	261.69	3.931	-10.405	2.018	-14.6950
960	800.0	1.300	8.917	3.923	11.409	10.863	3.37	266.56	3.644	-10.438	1.847	-14.7336
980	800.0	0.992	8.763	3.653	11.370	10.853	3.33	271.45	3.383	-10.471	1.693	-14.7714
1000	800.0	0.685	8.609	3.385	11.332	10.843	3.29	276.41	3.145	-10.502	1.554	-14.8086

SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 900° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log n(O_2)	log n(O)	log n(N_2)	log n(He)	log n(H)						
120	355.0	16.875	16.881	17.602	13.531		26.90	11.62	2.700 - 5	-4.569	2.461 - 8	-7.6089
125	428.2	16.592	16.699	17.344	13.456		26.58	14.20	1.832	-4.737	1.368	-7.8640
130	491.6	16.361	16.553	17.134	13.397		26.28	16.52	1.323	-4.878	8.506 - 9	-8.0703
135	546.4	16.163	16.431	16.956	13.350		25.99	18.59	9.949 - 6	-5.002	5.692	-8.2447
140	593.9	15.990	16.326	16.799	13.310		25.71	20.46	7.702	-5.113	4.010	-8.3968
145	635.0	15.833	16.233	16.658	13.276		25.44	22.14	6.090	-5.215	2.934	-8.5325
150	670.6	15.689	16.150	16.530	13.246		25.17	23.67	4.896	-5.310	2.210	-8.6556
155	701.4	15.556	16.073	16.410	13.220		24.90	25.06	3.988 - 6	-5.399	1.703 - 9	-8.7689
160	728.1	15.431	16.003	16.299	13.196		24.63	26.34	3.283	-5.484	1.336	-8.8742
165	751.2	15.312	15.936	16.193	13.175		24.36	27.51	2.727	-5.564	1.064	-8.9732
170	771.2	15.198	15.874	16.092	13.155		24.10	28.60	2.282	-5.642	8.576 -10	-9.0667
175	788.5	15.089	15.814	15.995	13.137		23.83	29.61	1.922	-5.716	6.986	-9.1557
180	803.4	14.983	15.758	15.902	13.119		23.57	30.56	1.628	-5.788	5.742	-9.2409
185	816.4	14.881	15.703	15.811	13.103		23.30	31.46	1.385	-5.858	4.756	-9.3228
190	827.6	14.781	15.650	15.723	13.088		23.04	32.30	1.184	-5.927	3.965	-9.4018
195	837.4	14.683	15.598	15.637	13.073		22.78	33.11	1.016	-5.993	3.325	-9.4782
200	845.8	14.587	15.548	15.552	13.059		22.52	33.88	8.753 - 7	-6.058	2.803	-9.5524
205	853.1	14.493	15.499	15.469	13.045		22.26	34.62	7.565 - 7	-6.121	2.374 -10	-9.6245
210	859.4	14.400	15.451	15.387	13.032		22.00	35.33	6.557	-6.183	2.019	-9.6948
215	864.8	14.308	15.404	15.307	13.019		21.75	36.03	5.700	-6.244	1.724	-9.7634
220	869.5	14.217	15.357	15.227	13.006		21.50	36.70	4.967	-6.304	1.477	-9.8305
225	873.6	14.127	15.311	15.148	12.994		21.26	37.36	4.340	-6.363	1.270	-9.8962
230	877.2	14.038	15.266	15.070	12.982		21.01	38.00	3.801	-6.420	1.095	-9.9605
235	880.2	13.950	15.221	14.992	12.970		20.78	38.62	3.336	-6.477	9.470 -11	-10.0236
240	882.9	13.862	15.177	14.915	12.959		20.55	39.24	2.934	-6.533	8.211	-10.0856
245	885.2	13.775	15.133	14.839	12.947		20.32	39.84	2.585	-6.588	7.137	-10.1465
250	887.2	13.689	15.089	14.763	12.936		20.10	40.43	2.282	-6.642	6.219	-10.2063
255	888.9	13.602	15.045	14.687	12.925		19.88	41.01	2.019 - 7	-6.695	5.430 -11	-10.2652
260	890.4	13.517	15.002	14.612	12.914		19.67	41.58	1.788	-6.748	4.753	-10.3231
265	891.7	13.431	14.959	14.537	12.903		19.47	42.13	1.587	-6.799	4.168	-10.3801
270	892.8	13.346	14.916	14.463	12.892		19.27	42.68	1.411	-6.851	3.662	-10.4362
275	893.8	13.261	14.873	14.388	12.881		19.08	43.22	1.256	-6.901	3.224	-10.4916
280	894.6	13.177	14.831	14.314	12.870		18.90	43.75	1.119	-6.951	2.844	-10.5461
285	895.3	13.092	14.789	14.240	12.859		18.72	44.26	9.989 - 8	-7.000	2.512	-10.5999
290	896.0	13.008	14.746	14.167	12.849		18.55	44.77	8.928	-7.049	2.223	-10.6530
295	896.5	12.924	14.704	14.093	12.838		18.39	45.27	7.990	-7.097	1.971	-10.7054
300	897.0	12.841	14.662	14.020	12.828		18.23	45.75	7.158	-7.145	1.750	-10.7571
310	897.7	12.674	14.579	13.874	12.807		17.93	46.70	5.766 - 8	-7.239	1.385 -11	-10.8586
320	898.3	12.508	14.496	13.729	12.786		17.65	47.60	4.664	-7.331	1.102	-10.9577
330	898.7	12.343	14.413	13.584	12.765		17.39	48.47	3.788	-7.422	8.817 -12	-11.0547
340	899.0	12.179	14.331	13.440	12.744		17.15	49.31	3.087	-7.510	7.085	-11.1497
350	899.3	12.014	14.248	13.296	12.724		16.93	50.12	2.525	-7.598	5.717	-11.2428
360	899.5	11.850	14.167	13.153	12.703		16.72	50.91	2.071	-7.684	4.642	-11.3343
370	899.6	11.687	14.085	13.010	12.683		16.52	51.69	1.704	-7.768	3.766	-11.4242
380	899.7	11.525	14.004	12.868	12.662		16.33	52.45	1.407	-7.852	3.071	-11.5127
390	899.8	11.363	13.923	12.726	12.642		16.15	53.21	1.164	-7.934	2.513	-11.5998
400	899.8	11.201	13.842	12.585	12.622		15.97	53.98	9.659 - 9	-8.015	2.062	-11.6858

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
410	899.9	11.040	13.767	12.444	12.602		15.79	54.76	8.036 - 9	-8.095	1.696 -12	-11.7707
420	899.9	10.880	13.681	12.303	12.582		15.60	55.57	6.704	-8.174	1.398	-11.8545
430	899.9	10.720	13.601	12.163	12.562		15.42	56.41	5.607	-8.251	1.155	-11.9373
440	899.9	10.560	13.521	12.023	12.542		15.22	57.30	4.703	-8.328	9.568 -13	-12.0192
450	900.0	10.401	13.442	11.884	12.522		15.02	58.24	3.955	-8.403	7.940	-12.1002
460	900.0	10.243	13.363	11.745	12.502		14.81	59.25	3.336	-8.477	6.602	-12.1803
470	900.0	10.084	13.283	11.607	12.482		14.58	60.35	2.822	-8.549	5.500	-12.2596
480	900.0	9.927	13.205	11.469	12.462		14.34	61.54	2.395	-8.621	4.591	-12.3381
490	900.0	9.770	13.126	11.331	12.443		14.09	62.84	2.039	-8.691	3.839	-12.4158
500	900.0	9.613	13.048	11.194	12.423	10.734	13.81	64.27	1.742	-8.759	3.216	-12.4926
510	900.0	9.456	12.970	11.057	12.404	10.729	13.52	65.84	1.494 - 9	-8.826	2.700 -13	-12.5686
520	900.0	9.301	12.892	10.921	12.384	10.725	13.22	67.57	1.286	-8.891	2.271	-12.6437
530	900.0	9.145	12.814	10.785	12.365	10.720	12.89	69.48	1.111	-8.954	1.914	-12.7180
540	900.0	8.990	12.736	10.649	12.345	10.715	12.55	71.58	9.643 -10	-9.016	1.617	-12.7913
550	900.0	8.836	12.659	10.514	12.326	10.710	12.19	73.90	8.404	-9.075	1.369	-12.8636
560	900.0	8.682	12.582	10.379	12.307	10.705	11.82	76.45	7.357	-9.133	1.162	-12.9349
570	900.0	8.528	12.505	10.244	12.287	10.700	11.43	79.26	6.470	-9.189	9.864 -14	-13.0051
580	900.0	8.375	12.429	10.110	12.268	10.695	11.04	82.33	5.717	-9.243	8.431	-13.0741
590	900.0	8.222	12.352	9.977	12.249	10.691	10.63	85.69	5.075	-9.295	7.213	-13.1419
600	900.0	8.070	12.276	9.843	12.230	10.686	10.23	89.34	4.527	-9.344	6.188	-13.2084
610	900.0	7.918	12.200	9.710	12.211	10.681	9.82	93.29	4.057 -10	-9.392	5.326 -14	-13.2736
620	900.0	7.76	12.125	9.578	12.192	10.676	9.42	97.55	3.653	-9.437	4.600	-13.3373
630	900.0	7.616	12.049	9.446	12.173	10.671	9.03	102.13	3.305	-9.481	3.986	-13.3994
640	900.0	7.465	11.974	9.314	12.154	10.667	8.64	107.01	3.003	-9.522	3.467	-13.4600
650	900.0	7.315	11.899	9.182	12.136	10.662	8.26	112.18	2.741	-9.562	3.027	-13.5189
660	900.0	7.165	11.824	9.051	12.117	10.657	7.90	117.63	2.513	-9.600	2.654	-13.5761
670	900.0	7.016	11.749	8.921	12.098	10.653	7.56	123.33	2.312	-9.636	2.336	-13.6315
680	900.0	6.867	11.675	8.790	12.080	10.648	7.23	129.25	2.136	-9.670	2.065	-13.6850
690	900.0	6.719	11.601	8.660	12.061	10.643	6.93	135.36	1.981	-9.703	1.834	-13.7367
700	900.0	6.571	11.527	8.531	12.043	10.639	6.64	141.61	1.843	-9.735	1.635	-13.7864
710	900.0	6.423	11.453	8.402	12.024	10.634	6.37	147.97	1.720 -10	-9.765	1.465 -14	-13.8342
720	900.0	6.276	11.379	8.273	12.006	10.629	6.13	154.38	1.610	-9.793	1.318	-13.8802
730	900.0	6.129	11.306	8.144	11.987	10.625	5.90	160.81	1.511	-9.821	1.191	-13.9242
740	900.0	5.983	11.233	8.016	11.969	10.620	5.69	167.20	1.421	-9.847	1.080	-13.9664
750	900.0	5.837	11.160	7.889	11.951	10.615	5.50	173.51	1.340	-9.873	9.845 -15	-14.0068
760	900.0	5.692	11.087	7.761	11.933	10.611	5.32	179.70	1.267	-9.897	9.008	-14.0454
770	900.0	5.547	11.015	7.634	11.914	10.606	5.16	185.74	1.199	-9.921	8.274	-14.0823
780	900.0	5.402	10.942	7.507	11.896	10.602	5.02	191.59	1.137	-9.944	7.629	-14.1175
790	900.0	5.258	10.870	7.381	11.878	10.597	4.89	197.23	1.080	-9.967	7.059	-14.1513
800	900.0	5.114	10.798	7.255	11.860	10.593	4.77	202.65	1.027	-9.988	6.553	-14.1835
820	900.0	4.827	10.655	7.004	11.824	10.584	4.57	212.75	9.332 -11	-10.030	5.701 -15	-14.2441
840	900.0	4.542	10.512	6.755	11.789	10.575	4.41	221.86	8.511	-10.070	5.014	-14.2998
860	900.0	3.977	10.230	6.260	11.718	10.557	4.17	237.22	7.151	-10.146	3.984	-14.3997
900	900.0	3.697	10.090	6.015	11.683	10.548	4.08	243.65	6.581	-10.182	3.589	-14.4450
920	900.0	3.418	9.950	5.771	11.648	10.539	4.01	249.38	6.068	-10.217	3.251	-14.4879
940	900.0	3.141	9.812	5.528	11.614	10.530	3.95	254.54	5.605	-10.251	2.959	-14.5289
960	900.0	2.865	9.674	5.287	11.579	10.522	3.90	259.23	5.185	-10.285	2.702	-14.5683
980	900.0	2.591	9.537	5.047	11.545	10.513	3.86	263.54	4.803	-10.318	2.476	-14.6063
1000	900.0	2.318	9.400	4.808	11.511	10.505	3.82	267.55	4.455	-10.351	2.274	-14.6432

SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 1000° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
120	355.0	16.875	16.881	17.602	13.531		26.90	11.62	2.700 - 5	-4.569	2.461 - 8	-7.6089
125	439.5	16.583	16.689	17.435	13.449		26.58	14.58	1.842	-4.735	1.340	-7.8730
130	513.0	16.351	16.539	17.123	13.387		26.29	17.23	1.345	-4.871	8.289 - 9	-8.0815
135	576.9	16.156	16.416	16.946	13.337		26.02	19.60	1.025	-4.989	5.560	-8.2549
140	632.3	15.986	16.311	16.792	13.296		25.76	21.74	8.046 - 6	-5.094	3.943	-8.4042
145	680.5	15.835	16.219	16.656	13.261		25.51	23.66	6.456	-5.190	2.910	-8.5361
150	722.4	15.697	16.138	16.532	13.231		25.26	25.41	5.266	-5.279	2.214	-8.6547
155	758.8	15.570	16.064	16.419	13.205		25.01	26.99	4.351 - 6	-5.361	1.725 - 9	-8.7632
160	790.4	15.452	15.995	16.313	13.181		24.77	28.43	3.633	-5.440	1.369	-8.8635
165	817.9	15.340	15.932	16.213	13.160		24.53	29.75	3.059	-5.514	1.104	-8.9572
170	841.8	15.234	15.873	16.119	13.141		24.29	30.97	2.595	-5.586	9.006 -10	-9.0455
175	862.5	15.132	15.817	16.028	13.123		24.05	32.10	2.214	-5.655	7.427	-9.1292
180	880.5	15.034	15.763	15.941	13.106		23.81	33.15	1.900	-5.721	6.180	-9.2090
185	896.2	14.939	15.712	15.857	13.090		23.58	34.13	1.637	-5.786	5.181	-9.2856
190	909.8	14.847	15.663	15.776	13.076		23.34	35.05	1.417	-5.849	4.373	-9.3592
195	921.6	14.757	15.615	15.697	13.062		23.11	35.92	1.231	-5.910	3.712	-9.4304
200	931.9	14.669	15.568	15.619	13.048		22.87	36.75	1.073	-5.970	3.166	-9.4994
205	940.8	14.583	15.523	15.543	13.035		22.64	37.54	9.376 - 7	-6.028	2.713 -10	-9.5665
210	948.6	14.498	15.479	15.468	13.023		22.41	38.30	8.218	-6.085	2.335	-9.6319
215	955.3	14.414	15.436	15.394	13.011		22.18	39.04	7.221	-6.141	2.016	-9.6955
220	961.2	14.332	15.393	15.322	12.999		21.95	39.74	6.361	-6.196	1.747	-9.7577
225	966.3	14.250	15.351	15.250	12.988		21.72	40.43	5.615	-6.251	1.518	-9.8187
230	970.7	14.169	15.310	15.179	12.977		21.50	41.10	4.967	-6.304	1.323	-9.8784
235	974.5	14.089	15.269	15.109	12.966		21.28	41.75	4.402	-6.356	1.156	-9.9370
240	977.9	14.010	15.228	15.039	12.955		21.06	42.39	3.909	-6.408	1.013	-9.9945
245	980.8	13.931	15.188	14.970	12.945		20.85	43.01	3.477	-6.459	8.890 -11	-10.0511
250	983.3	13.852	15.148	14.901	12.934		20.64	43.63	3.098	-6.509	7.821	-10.1067
255	985.5	13.774	15.109	14.832	12.924		20.44	44.23	2.765 - 7	-6.558	6.895 -11	-10.1614
260	987.4	13.697	15.070	14.764	12.914		20.24	44.82	2.471	-6.607	6.091	-10.2153
265	989.0	13.620	15.031	14.697	12.904		20.04	45.41	2.212	-6.655	5.390	-10.2684
270	990.5	13.543	14.992	14.629	12.894		19.85	45.98	1.982	-6.703	4.778	-10.3208
275	991.7	13.466	14.953	14.562	12.884		19.66	46.55	1.779	-6.750	4.243	-10.3723
280	992.8	13.390	14.915	14.495	12.874		19.48	47.10	1.599	-6.796	3.774	-10.4232
285	993.8	13.314	14.877	14.429	12.865		19.30	47.65	1.439	-6.842	3.362	-10.4734
290	994.6	13.238	14.839	14.362	12.855		19.13	48.19	1.296	-6.887	2.999	-10.5230
295	995.3	13.162	14.801	14.296	12.845		18.96	48.72	1.169	-6.932	2.680	-10.5719
300	995.9	13.087	14.763	14.230	12.836		18.80	49.25	1.056	-6.976	2.398	-10.6202
310	996.9	12.937	14.687	14.098	12.817		18.49	50.27	8.636 - 8	-7.064	1.927 -11	-10.7151
320	997.7	12.787	14.613	13.967	12.798		18.21	51.25	7.092	-7.149	1.557	-10.8078
330	998.2	12.638	14.538	13.837	12.779		17.94	52.21	5.846	-7.233	1.263	-10.8985
340	998.7	12.490	14.464	13.707	12.761		17.69	53.13	4.835	-7.316	1.030	-10.9872
350	999.0	12.342	14.390	13.578	12.742		17.45	54.02	4.011	-7.397	8.429 -12	-11.0742
360	999.2	12.195	14.316	13.449	12.724		17.23	54.88	3.338	-7.476	6.925	-11.1596
370	999.4	12.048	14.243	13.320	12.705		17.03	55.72	2.786	-7.555	5.710	-11.2434
380	999.6	11.902	14.169	13.192	12.687		16.83	56.54	2.332	-7.632	4.723	-11.3258
390	999.7	11.756	14.096	13.065	12.669		16.65	57.34	1.956	-7.709	3.918	-11.4069
400	999.8	11.611	14.024	12.937	12.650		16.47	58.13	1.645	-7.784	3.260	-11.4868

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
410	999.9	11.466	13.951	12.810	12.632		16.30	58.92	1.387 - 8	-7.858	2.719 -12	-11.5655
420	999.9	11.321	13.879	12.684	12.614		16.14	59.71	1.171	-7.931	2.274	-11.6432
430	999.9	11.177	13.807	12.558	12.596		15.97	60.50	9.919 - 9	-8.004	1.906	-11.7199
440	999.9	11.034	13.735	12.432	12.578		15.81	61.31	8.417	-8.075	1.601	-11.7957
450	999.9	10.890	13.664	12.307	12.560		15.64	62.14	7.158	-8.145	1.347	-11.8706
460	1000.0	10.748	13.592	12.182	12.542		15.48	62.99	6.101	-8.215	1.136	-11.9447
470	1000.0	10.605	13.521	12.057	12.525		15.30	63.89	5.211	-8.283	9.593 -13	-12.0181
480	1000.0	10.463	13.450	11.933	12.507		15.13	64.83	4.461	-8.351	8.117	-12.0906
490	1000.0	10.322	13.379	11.809	12.489		14.94	65.83	3.828	-8.417	6.879	-12.1625
500	1000.0	10.181	13.309	11.686	12.472	10.430	14.75	66.89	3.292	-8.483	5.840	-12.2336
510	1000.0	10.040	13.238	11.562	12.454	10.426	14.54	68.03	2.839 - 9	-8.547	4.965 -13	-12.3041
520	1000.0	9.900	13.169	11.440	12.436	10.421	14.33	69.25	2.454	-8.610	4.228	-12.3738
530	1000.0	9.760	13.098	11.317	12.419	10.417	14.10	70.58	2.127	-8.672	3.606	-12.4429
540	1000.0	9.621	13.029	11.195	12.401	10.412	13.86	72.02	1.848	-8.733	3.081	-12.5113
550	1000.0	9.481	12.959	11.073	12.384	10.408	13.60	73.57	1.611	-8.793	2.636	-12.5791
560	1000.0	9.343	12.890	10.952	12.367	10.404	13.34	75.27	1.408	-8.851	2.259	-12.6461
570	1000.0	9.205	12.821	10.831	12.349	10.399	13.05	77.12	1.235	-8.908	1.939	-12.7124
580	1000.0	9.067	12.752	10.710	12.332	10.395	12.76	79.13	1.087	-8.964	1.668	-12.7779
590	1000.0	8.929	12.683	10.590	12.315	10.391	12.45	81.32	9.594 -10	-9.018	1.437	-12.8427
600	1000.0	8.792	12.615	10.470	12.298	10.386	12.13	83.71	8.498	-9.071	1.240	-12.9066
610	1000.0	8.656	12.546	10.350	12.281	10.382	11.80	86.30	7.555 -10	-9.122	1.072 -13	-12.9697
620	1000.0	8.519	12.478	10.231	12.264	10.378	11.46	89.12	6.741	-9.171	9.291 -14	-13.0319
630	1000.0	8.383	12.410	10.112	12.247	10.373	11.11	92.16	6.036	-9.219	8.068	-13.0932
640	1000.0	8.248	12.342	9.993	12.230	10.369	10.76	95.45	5.426	-9.266	7.022	-13.1535
650	1000.0	8.113	12.275	9.875	12.213	10.365	10.40	99.00	4.895	-9.310	6.126	-13.2128
660	1000.0	7.978	12.207	9.757	12.196	10.361	10.05	102.81	4.433	-9.353	5.358	-13.2713
670	1000.0	7.844	12.140	9.640	12.179	10.356	9.69	106.88	4.030	-9.395	4.698	-13.3281
680	1000.0	7.710	12.073	9.522	12.162	10.352	9.34	111.23	3.677	-9.435	4.131	-13.3840
690	1000.0	7.576	12.007	9.405	12.146	10.348	8.99	115.83	3.367	-9.473	3.642	-13.4387
700	1000.0	7.443	11.940	9.289	12.129	10.344	8.66	120.70	3.094	-9.510	3.221	-13.4920
710	1000.0	7.310	11.874	9.173	12.112	10.340	8.33	125.82	2.852 -10	-9.545	2.857 -14	-13.5441
720	1000.0	7.178	11.807	9.057	12.096	10.335	8.01	131.18	2.639	-9.579	2.542	-13.5948
730	1000.0	7.046	11.741	8.941	12.079	10.331	7.71	136.75	2.449	-9.611	2.270	-13.6440
740	1000.0	6.914	11.675	8.826	12.063	10.327	7.41	142.52	2.280	-9.642	2.033	-13.6919
750	1000.0	6.783	11.610	8.711	12.046	10.323	7.14	148.45	2.128	-9.672	1.827	-13.7382
760	1000.0	6.652	11.544	8.596	12.030	10.319	6.88	154.53	1.992	-9.701	1.648	-13.7831
770	1000.0	6.521	11.479	8.482	12.014	10.315	6.63	160.71	1.870	-9.728	1.491	-13.8265
780	1000.0	6.391	11.414	8.368	11.997	10.311	6.40	166.96	1.759	-9.755	1.354	-13.8683
790	1000.0	6.261	11.349	8.254	11.981	10.307	6.19	173.25	1.659	-9.780	1.234	-13.9087
800	1000.0	6.132	11.284	8.141	11.965	10.302	5.99	179.53	1.567	-9.805	1.128	-13.9476
820	1000.0	5.874	11.155	7.915	11.933	10.294	5.63	191.97	1.407 -10	-9.852	9.527 -15	-14.0210
840	1000.0	5.617	11.027	7.690	11.901	10.286	5.33	204.01	1.272	-9.896	8.149	-14.0889
860	1000.0	5.109	10.773	7.245	11.837	10.270	4.86	226.13	1.056	-9.976	6.172	-14.2095
900	1000.0	4.856	10.647	7.024	11.805	10.262	4.68	235.96	9.686 -11	-10.014	5.455	-14.2632
920	1000.0	4.605	10.521	6.805	11.774	10.254	4.54	244.91	8.913	-10.050	4.863	-14.3131
940	1000.0	4.356	10.396	6.586	11.743	10.247	4.42	252.99	8.225	-10.085	4.368	-14.3597
960	1000.0	4.108	10.272	6.369	11.712	10.239	4.32	260.25	7.608	-10.119	3.949	-14.4035
980	1000.0	3.861	10.149	6.153	11.681	10.231	4.23	266.76	7.052	-10.152	3.591	-14.4448
1000	1000.0	3.616	10.026	5.938	11.650	10.223	4.17	272.59	6.548	-10.184	3.281	-14.4840

SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 1100° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
120	355.0	16.875	16.881	17.602	13.531		26.90	11.62	2.700 - 5	-4.569	2.481 - 8	-7.6089
125	448.9	16.576	16.681	17.328	13.444		26.59	14.88	1.850	-4.733	1.317	-7.8803
130	531.0	16.343	16.527	17.114	13.378		26.31	17.82	1.362	-4.866	8.115 - 9	-8.0907
135	602.7	16.149	16.403	16.938	13.327		26.05	20.46	1.049	-4.979	5.451	-8.2635
140	665.4	15.982	16.298	16.786	13.285		25.80	22.84	8.325 - 6	-5.080	3.882	-8.4110
145	720.2	15.835	16.207	16.653	13.249		25.56	24.99	6.754	-5.170	2.883	-8.5401
150	768.1	15.702	16.126	16.533	13.219		25.33	26.94	5.572	-5.254	2.210	-8.6557
155	809.9	15.580	16.054	16.423	13.192		25.10	28.71	4.655 - 6	-5.332	1.735 - 9	-8.7606
160	846.5	15.466	15.988	16.322	13.168		24.88	30.32	3.930	-5.406	1.389	-8.8573
165	878.4	15.360	15.926	16.226	13.147		24.66	31.79	3.346	-5.476	1.129	-8.9471
170	906.4	15.259	15.869	16.137	13.128		24.44	33.15	2.868	-5.542	9.301 -10	-9.0315
175	930.8	15.163	15.815	16.051	13.110		24.22	34.40	2.474	-5.607	7.741	-9.1112
180	952.1	15.071	15.764	15.969	13.094		24.00	35.56	2.144	-5.669	6.501	-9.1870
185	970.8	14.982	15.716	15.890	13.078		23.79	36.65	1.867	-5.729	5.502	-9.2595
190	987.0	14.896	15.669	15.814	13.064		23.57	37.66	1.632	-5.787	4.687	-9.3291
195	1001.3	14.812	15.624	15.740	13.050		23.36	38.61	1.431	-5.844	4.016	-9.3962
200	1013.7	14.730	15.580	15.667	13.038		23.14	39.51	1.259	-5.900	3.458	-9.4612
205	1024.6	14.650	15.538	15.596	13.025		22.93	40.37	1.111 - 6	-5.954	2.991 -10	-9.5242
210	1034.1	14.571	15.497	15.527	13.013		22.72	41.18	9.830 - 7	-6.007	2.597	-9.5854
215	1042.4	14.494	15.456	15.459	13.002		22.51	41.97	8.716	-6.060	2.264	-9.6452
220	1049.7	14.417	15.417	15.392	12.991		22.30	42.72	7.746	-6.111	1.979	-9.7035
225	1056.0	14.342	15.378	15.326	12.980		22.09	43.45	6.897	-6.161	1.735	-9.7606
230	1061.6	14.268	15.339	15.260	12.970		21.89	44.15	6.153	-6.211	1.526	-9.8165
235	1066.4	14.194	15.301	15.195	12.960		21.68	44.84	5.499	-6.260	1.345	-9.8714
240	1070.6	14.121	15.264	15.131	12.950		21.48	45.51	4.923	-6.308	1.188	-9.9252
245	1074.3	14.049	15.227	15.068	12.940		21.28	46.16	4.414	-6.355	1.052	-9.9781
250	1077.6	13.977	15.191	15.005	12.930		21.09	46.80	3.964	-6.402	9.329 -11	-10.0302
255	1080.4	13.905	15.154	14.942	12.921		20.89	47.43	3.565 - 7	-6.448	8.291 -11	-10.0814
260	1082.9	13.834	15.118	14.880	12.911		20.70	48.05	3.210	-6.493	7.382	-10.1318
265	1085.0	13.764	15.083	14.818	12.902		20.52	48.65	2.895	-6.538	6.584	-10.1815
270	1086.9	13.693	15.047	14.756	12.893		20.33	49.25	2.614	-6.583	5.881	-10.2305
275	1088.6	13.624	15.012	14.695	12.884		20.15	49.84	2.363	-6.627	5.261	-10.2789
280	1090.0	13.554	14.977	14.634	12.875		19.98	50.43	2.139	-6.670	4.714	-10.3266
285	1091.3	13.484	14.942	14.573	12.866		19.80	51.00	1.938	-6.713	4.230	-10.3737
290	1092.4	13.415	14.907	14.512	12.857		19.64	51.57	1.758	-6.755	3.801	-10.4202
295	1093.3	13.346	14.872	14.452	12.848		19.47	52.13	1.596	-6.797	3.419	-10.4661
300	1094.2	13.278	14.838	14.392	12.840		19.31	52.68	1.451	-6.838	3.080	-10.5114
310	1095.5	13.141	14.769	14.272	12.822		19.00	53.76	1.202 - 7	-6.920	2.509 -11	-10.6006
320	1096.6	13.005	14.701	14.153	12.805		18.71	54.81	1.000	-7.000	2.053	-10.6877
330	1097.4	12.869	14.633	14.034	12.788		18.44	55.84	8.348 - 8	-7.078	1.687	-10.7729
340	1098.0	12.734	14.565	13.916	12.771		18.18	56.83	6.990	-7.156	1.392	-10.8564
350	1098.5	12.600	14.498	13.798	12.754		17.94	57.80	5.871	-7.231	1.153	-10.9382
360	1098.8	12.466	14.431	13.681	12.737		17.71	58.74	4.945	-7.306	9.585 -12	-11.0184
370	1099.1	12.332	14.364	13.566	12.720		17.49	59.65	4.176	-7.379	7.995	-11.0972
380	1099.3	12.199	14.297	13.447	12.704		17.29	60.54	3.536	-7.451	6.690	-11.1746
390	1099.5	12.067	14.231	13.331	12.687		17.10	61.41	3.00	-7.523	5.614	-11.2507
400	1099.6	11.934	14.165	13.216	12.670		16.92	62.25	2.551	-7.593	4.725	-11.3256

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_3)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
410	1099.7	11.803	14.099	13.100	12.654		16.75	63.09	2.177 - 8	-7.662	3.987 -12	-11.3994
420	1099.8	11.671	14.033	12.985	12.638		16.58	63.91	1.859	-7.731	3.372	-11.4721
430	1099.8	11.540	13.968	12.871	12.621		16.42	64.72	1.592	-7.798	2.858	-11.5439
440	1099.9	11.410	13.903	12.756	12.605		16.27	65.53	1.365	-7.865	2.428	-11.6147
450	1099.9	11.280	13.837	12.642	12.588		16.12	66.34	1.173	-7.931	2.067	-11.6846
460	1099.9	11.150	13.773	12.529	12.572		15.97	67.17	1.010	-7.996	1.763	-11.7537
470	1099.9	11.020	13.708	12.415	12.556		15.82	68.00	8.709 - 9	-8.060	1.506	-11.8221
480	1100.0	10.891	13.643	12.302	12.540		15.67	68.85	7.525	-8.123	1.289	-11.8897
490	1100.0	10.763	13.579	12.190	12.524		15.52	69.73	6.514	-8.186	1.105	-11.9566
500	1100.0	10.634	13.515	12.077	12.508	10.175	15.36	70.64	5.649	-8.248	9.487 -13	-12.0229
510	1100.0	10.507	13.451	11.966	12.492	10.171	15.20	71.59	4.908 - 9	-8.309	8.157 -13	-12.0885
520	1100.0	10.379	13.387	11.854	12.476	10.167	15.03	72.59	4.272	-8.369	7.023	-12.1535
530	1100.0	10.252	13.324	11.743	12.460	10.163	14.86	73.65	3.726	-8.429	6.055	-12.2179
540	1100.0	10.125	13.260	11.632	12.444	10.159	14.68	74.76	3.256	-8.487	5.228	-12.2817
550	1100.0	9.999	13.197	11.521	12.428	10.155	14.50	75.95	2.851	-8.545	4.520	-12.3449
560	1100.0	9.873	13.134	11.411	12.412	10.151	14.30	77.22	2.502	-8.602	3.912	-12.4076
570	1100.0	9.747	13.071	11.301	12.397	10.147	14.09	78.58	2.203	-8.657	3.391	-12.4698
580	1100.0	9.622	13.009	11.191	12.381	10.143	13.88	80.03	1.940	-8.712	2.944	-12.5311
590	1100.0	9.497	12.946	11.081	12.365	10.139	13.65	81.60	1.714	-8.766	2.558	-12.5921
600	1100.0	9.372	12.884	10.972	12.350	10.135	13.41	83.29	1.518	-8.819	2.226	-12.6524
610	1100.0	9.248	12.822	10.864	12.334	10.131	13.16	85.11	1.348 - 9	-8.870	1.940 -13	-12.7121
620	1100.0	9.124	12.760	10.755	12.319	10.127	12.90	87.08	1.200	-8.921	1.693	-12.7712
630	1100.0	9.000	12.698	10.647	12.303	10.123	12.63	89.20	1.072	-8.970	1.480	-12.8297
640	1100.0	8.877	12.636	10.539	12.288	10.119	12.35	91.48	9.594 -10	-9.018	1.296	-12.8876
650	1100.0	8.754	12.575	10.432	12.273	10.115	12.06	93.94	8.612	-9.065	1.136	-12.9447
660	1100.0	8.632	12.514	10.324	12.257	10.111	11.76	96.59	7.754	-9.110	9.974 -14	-13.0011
670	1100.0	8.510	12.453	10.218	12.242	10.108	11.46	99.44	7.002	-9.155	8.773	-13.0568
680	1100.0	8.388	12.392	10.111	12.227	10.104	11.15	102.50	6.342	-9.198	7.7[illegible]	-13.1118
690	1100.0	8.267	12.331	10.005	12.212	10.100	10.83	105.78	5.761	-9.240	6.[illegible]	-13.1659
700	1100.0	8.146	12.270	9.899	12.196	10.096	10.52	109.28	5.249	-9.280	6.[illegible]	-13.2192
710	1100.0	8.025	12.210	9.793	12.181	10.092	10.20	113.01	4.797 -10	-9.319	5.350 -14	-13.2717
720	1100.0	7.904	12.150	9.688	12.166	10.089	9.88	116.97	4.398	-9.357	4.751	-13.3232
730	1100.0	7.784	12.090	9.582	12.151	10.085	9.57	121.18	4.043	-9.393	4.229	-13.3738
740	1100.0	7.665	12.030	9.478	12.136	10.081	9.25	125.62	3.728	-9.428	3.772	-13.4234
750	1100.0	7.545	11.970	9.373	12.121	10.077	8.95	130.29	3.448	-9.462	3.373	-13.4720
760	1100.0	7.426	11.911	9.269	12.106	10.073	8.65	135.20	3.198	-9.495	3.023	-13.5195
770	1100.0	7.307	11.851	9.165	12.092	10.070	8.35	140.32	2.974	-9.527	2.716	-13.5660
780	1100.0	7.189	11.792	9.061	12.077	10.066	8.07	145.65	2.773	-9.557	2.447	-13.6114
790	1100.0	7.071	11.733	8.958	12.062	10.062	7.80	151.18	2.592	-9.586	2.210	-13.6556
800	1100.0	6.953	11.674	8.855	12.047	10.059	7.54	156.88	2.429	-9.615	2.001	-13.6987
820	1100.0	6.719	11.557	8.650	12.018	10.051	7.05	168.73	2.148 -10	-9.668	1.655 -14	-13.7813
840	1100.0	6.486	11.441	8.445	11.989	10.044	6.60	181.01	1.916	-9.718	1.383	-13.8590
860	1100.0	6.023	11.209	8.041	11.931	10.029	5.87	205.99	1.558	-9.808	9.994 -15	-14.0003
900	1100.0	5.794	11.095	7.840	11.902	10.022	5.57	218.25	1.418	-9.848	8.631	-14.0639
920	1100.0	5.566	10.981	7.640	11.874	10.015	5.31	230.09	1.297	-9.887	7.529	-14.1232
940	1100.0	5.339	10.867	7.442	11.845	10.008	5.09	241.36	1.191	-9.924	6.630	-14.1785
960	1100.0	5.113	10.754	7.244	11.817	10.001	4.90	251.95	1.098	-9.959	5.889	-14.2299
980	1100.0	4.889	10.642	7.048	11.789	9.994	4.75	261.78	1.016	-9.993	5.272	-14.2780
1000	1100.0	4.666	10.531	6.852	11.761	9.987	4.61	270.83	9.425 -11	-10.026	4.753	-14.3230

SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 1300° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log n(O_2)	log n(O)	log n(N_2)	log n(He)	log n(H)						
120	355.0	16.875	16.881	17.602	13.531		26.90	11.62	2.700 - 5	-4.569	2.461 - 8	-7.6089
125	461.3	16.567	16.670	17.319	13.437		26.59	15.29	1.859	-4.731	1.289	-7.8897
130	555.6	16.332	16.512	17.102	13.367		26.32	18.63	1.384	-4.859	7.886 - 9	-8.1031
135	639.3	16.139	16.385	16.926	13.313		26.08	21.68	1.080	-4.967	5.297	-8.2759
140	713.5	15.975	16.279	16.776	13.269		25.85	24.45	8.693 - 6	-5.061	3.787	-8.4217
145	779.5	15.832	16.188	16.646	13.232		25.63	26.98	7.157	-5.145	2.830	-8.5482
150	838.0	15.704	16.109	16.530	13.200		25.42	29.29	5.991	-5.222	2.186	-8.6604
155	890.0	15.587	16.037	16.425	13.173		25.21	31.40	5.081 - 6	-5.294	1.731 - 9	-8.7618
160	936.1	15.480	15.973	16.328	13.149		25.01	33.34	4.354	-5.361	1.399	-8.8560
165	977.0	15.380	15.913	16.238	13.127		24.82	35.13	3.763	-5.424	1.150	-8.9396
170	1013.3	15.286	15.858	16.154	13.107		24.63	36.78	3.274	-5.485	9.571 -10	-9.0191
175	1045.5	15.197	15.807	16.074	13.089		24.43	38.30	2.866	-5.543	8.056	-9.0939
180	1074.1	15.112	15.759	15.998	13.073		24.25	39.72	2.521	-5.598	6.845	-9.1646
185	1099.5	15.030	15.713	15.926	13.058		24.06	41.03	2.228	-5.652	5.863	-9.2319
190	1122.1	14.952	15.669	15.856	13.044		23.87	42.27	1.976	-5.704	5.056	-9.2962
195	1142.1	14.876	15.628	15.789	13.030		23.69	43.42	1.758	-5.755	4.386	-9.3579
200	1159.8	14.802	15.587	15.723	13.018		23.51	44.51	1.569	-5.804	3.825	-9.4174
205	1175.6	14.730	15.549	15.660	13.006		23.32	45.52	1.404 - 6	-5.853	3.351 -10	-9.4749
210	1189.6	14.660	15.511	15.598	12.995		23.14	46.51	1.260	-5.900	2.947	-9.5306
215	1202.0	14.592	15.474	15.537	12.984		22.96	47.44	1.133	-5.946	2.602	-9.5847
220	1213.0	14.524	15.439	15.478	12.973		22.78	48.32	1.020	-5.991	2.305	-9.6374
225	1222.9	14.458	15.404	15.419	12.963		22.60	49.17	9.208 - 7	-6.036	2.047	-9.6889
230	1231.5	14.393	15.370	15.362	12.954		22.43	49.99	8.324	-6.080	1.823	-9.7392
235	1239.2	14.328	15.336	15.305	12.944		22.25	50.78	7.538	-6.123	1.628	-9.7886
240	1246.0	14.265	15.303	15.249	12.935		22.07	51.54	6.836	-6.165	1.457	-9.8367
245	1252.1	14.202	15.270	15.193	12.926		21.90	52.28	6.209	-6.207	1.306	-9.8840
250	1257.5	14.139	15.238	15.139	12.917		21.73	53.00	5.646	-6.248	1.173	-9.9306
255	1262.3	14.077	15.206	15.084	12.909		21.56	53.71	5.141 - 7	-6.289	1.056 -10	-9.9763
260	1266.5	14.016	15.175	15.030	12.900		21.39	54.39	4.687	-6.329	9.520 -11	-10.0214
265	1270.3	13.955	15.144	14.977	12.892		21.22	55.07	4.278	-6.369	8.595	-10.0657
270	1273.6	13.895	15.113	14.924	12.884		21.06	55.73	3.908	-6.408	7.772	-10.1095
275	1276.6	13.835	15.083	14.871	12.876		20.89	56.38	3.575	-6.447	7.037	-10.1526
280	1279.2	13.775	15.052	14.819	12.868		20.73	57.02	3.273	-6.485	6.381	-10.1951
285	1281.5	13.715	15.022	14.766	12.860		20.58	57.65	3.000	-6.523	5.793	-10.2371
290	1283.6	13.656	14.992	14.715	12.853		20.42	58.27	2.752	-6.560	5.265	-10.2786
295	1285.5	13.597	14.962	14.663	12.845		20.27	58.88	2.527	-6.597	4.791	-10.3195
300	1287.1	13.538	14.933	14.611	12.837		20.12	59.49	2.322	-6.634	4.365	-10.3600
310	1289.8	13.422	14.874	14.509	12.822		19.82	60.68	1.966 - 7	-6.706	3.634 -11	-10.4396
320	1292.0	13.306	14.816	14.407	12.807		19.54	61.84	1.670	-6.777	3.038	-10.5174
330	1293.7	13.190	14.758	14.306	12.793		19.27	62.98	1.423	-6.847	2.549	-10.5936
340	1295.0	13.076	14.700	14.206	12.778		19.01	64.09	1.215	-6.915	2.146	-10.6683
350	1296.1	12.962	14.643	14.106	12.764		18.77	65.18	1.041	-6.982	1.813	-10.7415
360	1296.9	12.848	14.586	14.006	12.749		18.53	66.25	8.943 - 8	-7.049	1.537	-10.8134
370	1297.6	12.735	14.529	13.907	12.735		18.31	67.29	7.699	-7.114	1.306	-10.8839
380	1298.1	12.622	14.473	13.808	12.721		18.09	68.31	6.643	-7.178	1.114	-10.9532
390	1298.5	12.509	14.416	13.710	12.707		17.89	69.31	5.745	-7.241	9.521 -12	-11.0213
400	1298.8	12.397	14.360	13.612	12.693		17.70	70.28	4.978	-7.303	8.160	-11.0883

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
410	1299.1	12.286	14.305	13.514	12.679		17.52	71.24	4.322 - 8	-7.364	7.010 -12	-11.1543
420	1299.3	12.175	14.249	13.417	12.665		17.35	72.18	3.759	-7.425	6.036	-11.2192
430	1299.4	12.064	14.193	13.320	12.651		17.18	73.09	3.276	-7.485	5.209	-11.2832
440	1299.5	11.953	14.138	13.223	12.637		17.02	74.00	2.859	-7.544	4.505	-11.3463
450	1299.6	11.843	14.083	13.127	12.623		16.87	74.89	2.500	-7.602	3.903	-11.4086
460	1299.7	11.733	14.028	13.030	12.609		16.73	75.76	2.189	-7.660	3.388	-11.4700
470	1299.8	11.624	13.973	12.934	12.596		16.59	76.63	1.920	-7.717	2.946	-11.5307
480	1299.8	11.514	13.919	12.839	12.582		16.45	77.50	1.686	-7.773	2.567	-11.5907
490	1299.9	11.406	13.864	12.744	12.568		16.32	78.36	1.483	-7.829	2.239	-11.6499
500	1299.9	11.297	13.810	12.649	12.555	9.772	16.19	79.22	1.306	-7.884	1.956	-11.7085
510	1299.9	11.189	13.756	12.554	12.541	9.769	16.06	80.09	1.152 - 8	-7.938	1.712 -12	-11.7665
520	1299.9	11.081	13.702	12.459	12.528	9.766	15.93	80.97	1.018	-7.992	1.500	-11.8239
530	1299.9	10.973	13.648	12.365	12.514	9.762	15.80	81.86	9.001 - 9	-8.046	1.316	-11.8808
540	1300.0	10.866	13.594	12.271	12.501	9.759	15.67	82.77	7.971	-8.098	1.156	-11.9371
550	1300.0	10.759	13.541	12.178	12.487	9.755	15.54	83.71	7.069	-8.151	1.017	-11.9928
560	1300.0	10.652	13.488	12.084	12.474	9.752	15.41	84.66	6.277	-8.202	8.951 -13	-12.0481
570	1300.0	10.546	13.434	11.991	12.461	9.749	15.28	85.65	5.582	-8.253	7.890	-12.1029
580	1300.0	10.440	13.381	11.898	12.448	9.745	15.14	86.68	4.970	-8.304	6.962	-12.1572
590	1300.0	10.334	13.329	11.806	12.434	9.742	15.00	87.75	4.432	-8.353	6.150	-12.2111
600	1300.0	10.229	13.276	11.713	12.421	9.739	14.85	88.86	3.957	-8.403	5.438	-12.2645
610	1300.0	10.124	13.223	11.621	12.408	9.735	14.70	90.03	3.538 - 9	-8.451	4.814 -13	-12.3175
620	1300.0	10.019	13.171	11.530	12.395	9.732	14.55	91.26	3.169	-8.499	4.265	-12.3701
630	1300.0	9.914	13.119	11.438	12.382	9.729	14.39	92.55	2.842	-8.546	3.783	-12.4222
640	1300.0	9.810	13.067	11.347	12.369	9.725	14.22	93.92	2.553	-8.593	3.358	-12.4739
650	1300.0	9.706	13.015	11.256	12.356	9.722	14.04	95.36	2.297	-8.639	2.984	-12.5252
660	1300.0	9.603	12.963	11.165	12.343	9.719	13.86	96.89	2.070	-8.684	2.655	-12.5760
670	1300.0	9.499	12.911	11.075	12.330	9.716	13.67	98.51	1.869	-8.728	2.364	-12.6264
680	1300.0	9.396	12.860	10.984	12.317	9.712	13.47	100.23	1.690	-8.772	2.107	-12.6764
690	1300.0	9.293	12.808	10.895	12.304	9.709	13.27	102.06	1.531	-8.815	1.879	-12.7260
700	1300.0	9.191	12.757	10.805	12.291	9.706	13.06	104.00	1.389	-8.857	1.678	-12.7751
710	1300.0	9.089	12.706	10.715	12.279	9.703	12.84	106.05	1.263 - 9	-8.899	1.501 -13	-12.8238
720	1300.0	8.987	12.655	10.626	12.266	9.700	12.62	108.26	1.150	-8.939	1.343	-12.8720
730	1300.0	8.885	12.604	10.537	12.253	9.696	12.39	110.59	1.050	-8.979	1.203	-12.9197
740	1300.0	8.784	12.553	10.449	12.240	9.693	12.15	113.07	9.600 -10	-9.018	1.079	-12.9669
750	1300.0	8.683	12.503	10.360	12.228	9.690	11.91	115.70	8.797	-9.056	9.691 -14	-13.0137
760	1300.0	8.582	12.453	10.272	12.215	9.687	11.66	118.49	8.076	-9.093	8.712	-13.0599
770	1300.0	8.482	12.402	10.184	12.203	9.684	11.41	121.44	7.430	-9.129	7.842	-13.1056
780	1300.0	8.382	12.352	10.096	12.190	9.680	11.15	124.57	6.850	-9.164	7.068	-13.1507
790	1300.0	8.282	12.302	10.009	12.178	9.677	10.89	127.88	6.328	-9.199	6.378	-13.1953
800	1300.0	8.182	12.253	9.922	12.165	9.674	10.63	131.37	5.858	-9.232	5.764	-13.2393
820	1300.0	7.984	12.153	9.748	12.140	9.668	10.11	138.93	5.052 -10	-9.297	4.727 -14	-13.3255
840	1300.0	7.787	12.055	9.575	12.116	9.662	9.59	147.26	4.393	-9.357	3.899	-13.4091
860	1300.0	7.395	11.859	9.233	12.067	9.649	8.59	166.22	3.401	-9.468	2.704	-13.5680
900	1300.0	7.201	11.762	9.063	12.042	9.643	8.12	176.80	3.026	-9.519	2.275	-13.6431
920	1300.0	7.008	11.666	8.894	12.018	9.637	7.68	188.01	2.712	-9.567	1.927	-13.7150
940	1300.0	6.816	11.570	8.726	11.994	9.631	7.27	199.76	2.446	-9.612	1.645	-13.7838
960	1300.0	6.625	11.474	8.559	11.970	9.625	6.89	211.94	2.219	-9.654	1.415	-13.8493
980	1300.0	6.436	11.379	8.393	11.947	9.619	6.54	224.39	2.025	-9.694	1.226	-13.9116
1000	1300.0	6.247	11.285	8.227	11.923	9.613	6.23	236.99	1.857	-9.731	1.070	-13.9706

SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 1500° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
120	355.0	16.875	16.881	17.602	13.531		26.90	11.62	2.700 - 5	-4.569	2.461 - 8	-7.6089
125	466.4	16.564	16.666	17.315	13.434		26.59	15.46	1.863	-4.730	1.278	-7.8936
130	566.9	16.326	16.505	17.096	13.362		26.33	19.01	1.393	-4.856	7.781 - 9	-8.1090
135	657.7	16.133	16.376	16.919	13.306		26.09	22.29	1.093	-4.961	5.216	-8.2827
140	739.6	15.970	16.269	16.770	13.260		25.87	25.32	8.861 - 6	-5.053	3.727	-8.4286
145	813.6	15.827	16.177	16.640	13.222		25.66	28.13	7.349	-5.134	2.787	-8.5548
150	880.4	15.701	16.096	16.525	13.189		25.46	30.72	6.200	-5.208	2.156	-8.6663
155	940.6	15.586	16.025	16.421	13.161		25.27	33.12	5.301 - 6	-5.276	1.713 - 9	-8.7663
160	995.0	15.481	15.960	16.326	13.136		25.08	35.35	4.581	-5.339	1.389	-8.8574
165	1044.2	15.384	15.901	16.238	13.113		24.90	37.43	3.993	-5.399	1.145	-8.9411
170	1088.5	15.293	15.846	16.156	13.093		24.72	39.36	3.505	-5.455	9.575 -10	-9.0189
175	1128.5	15.207	15.796	16.079	13.074		24.55	41.16	3.096	-5.509	8.099	-9.0916
180	1164.7	15.126	15.748	16.006	13.057		24.37	42.84	2.749	-5.561	6.918	-9.1600
185	1197.3	15.048	15.703	15.937	13.042		24.20	44.42	2.451	-5.611	5.959	-9.2248
190	1226.7	14.974	15.661	15.871	13.027		24.04	45.90	2.194	-5.659	5.171	-9.2865
195	1253.3	14.902	15.621	15.807	13.014		23.87	47.29	1.971	-5.705	4.515	-9.3454
200	1277.3	14.833	15.582	15.745	13.001		23.70	48.60	1.776	-5.751	3.964	-9.4019
205	1299.0	14.766	15.545	15.686	12.989		23.54	49.85	1.604 - 6	-5.795	3.497 -10	-9.4563
210	1318.5	14.701	15.509	15.628	12.977		23.38	51.03	1.453	-5.838	3.098	-9.5089
215	1336.2	14.637	15.474	15.571	12.967		23.22	52.15	1.319	-5.880	2.756	-9.5597
220	1352.1	14.575	15.440	15.516	12.956		23.06	53.22	1.199	-5.921	2.460	-9.6091
225	1366.5	14.514	15.408	15.462	12.946		22.90	54.24	1.093	-5.961	2.202	-9.6571
230	1379.5	14.455	15.376	15.410	12.937		22.74	55.22	9.974 - 7	-6.001	1.977	-9.7039
235	1391.2	14.396	15.345	15.358	12.928		22.58	56.16	9.117	-6.040	1.780	-9.7496
240	1401.8	14.338	15.314	15.307	12.919		22.43	57.07	8.347	-6.078	1.606	-9.7942
245	1411.3	14.281	15.284	15.256	12.910		22.27	57.94	7.652	-6.116	1.452	-9.8379
250	1420.0	14.225	15.255	15.207	12.902		22.12	58.79	7.023	-6.153	1.316	-9.8808
255	1427.8	14.169	15.226	15.158	12.894		21.97	59.61	6.455 - 7	-6.190	1.194 -10	-9.9228
260	1434.9	14.114	15.197	15.109	12.886		21.82	60.41	5.939	-6.226	1.086	-9.9641
265	1441.1	14.060	15.169	15.061	12.878		21.67	61.19	5.470	-6.262	9.892 -11	-10.0047
270	1446.9	14.006	15.141	15.014	12.871		21.52	61.95	5.043	-6.297	9.022	-10.0447
275	1452.0	13.952	15.113	14.967	12.863		21.37	62.69	4.654	-6.332	8.240	-10.0841
280	1456.7	13.899	15.086	14.920	12.856		21.23	63.42	4.300	-6.367	7.536	-10.1228
285	1460.9	13.846	15.059	14.874	12.849		21.08	64.13	3.975	-6.401	6.901	-10.1611
290	1464.7	13.794	15.032	14.829	12.841		20.94	64.83	3.679	-6.434	6.327	-10.1988
295	1468.1	13.742	15.006	14.782	12.834		20.80	65.52	3.407	-6.468	5.807	-10.2361
300	1471.2	13.690	14.979	14.737	12.827		20.66	66.19	3.158	-6.501	5.335	-10.2729
310	1476.6	13.587	14.927	14.646	12.814		20.39	67.52	2.719 - 7	-6.566	4.517 -11	-10.3451
320	1480.9	13.485	14.876	14.557	12.800		20.13	68.81	2.348	-6.629	3.839	-10.4157
330	1484.4	13.384	14.825	14.468	12.787		19.88	70.06	2.033	-6.692	3.275	-10.4848
340	1487.3	13.284	14.774	14.380	12.774		19.63	71.29	1.765	-6.753	2.802	-10.5525
350	1489.7	13.184	14.724	14.293	12.762		19.39	72.50	1.536	-6.814	2.405	-10.6189
360	1491.6	13.085	14.674	14.206	12.749		19.16	73.68	1.339	-6.873	2.070	-10.6841
370	1493.1	12.986	14.624	14.120	12.736		18.94	74.83	1.171	-6.932	1.786	-10.7480
380	1494.4	12.888	14.575	14.034	12.724		18.73	75.96	1.025	-6.989	1.546	-10.8109
390	1495.4	12.790	14.526	13.948	12.711		18.53	77.08	8.997 - 8	-7.046	1.341	-10.8726
400	1496.3	12.693	14.477	13.863	12.699		18.34	78.17	7.909	-7.102	1.166	-10.9334

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
410	1497.0	12.596	14.429	13.778	12.687		18.15	79.24	6.966 - 8	-7.157	1.016 -11	-10.9932
420	1497.5	12.499	14.380	13.693	12.675		17.97	80.29	6.145	-7.211	8.870 -12	-11.0521
430	1498.0	12.403	14.332	13.609	12.663		17.80	81.32	5.430	-7.265	7.761	-11.1101
440	1498.4	12.307	14.284	13.525	12.651		17.64	82.33	4.805	-7.318	6.804	-11.1673
450	1498.7	12.211	14.236	13.441	12.639		17.48	83.33	4.259	-7.371	5.975	-11.2236
460	1498.9	12.116	14.188	13.358	12.627		17.33	84.31	3.780	-7.422	5.257	-11.2792
470	1499.1	12.021	14.141	13.275	12.615		17.19	85.27	3.359	-7.474	4.633	-11.3341
480	1499.3	11.926	14.094	13.192	12.603		17.05	86.22	2.989	-7.524	4.089	-11.3883
490	1499.4	11.832	14.046	13.109	12.591		16.92	87.16	2.664	-7.575	3.615	-11.4419
500	1499.5	11.738	13.999	13.027	12.579	9.474	16.79	88.09	2.376	-7.624	3.201	-11.4948
510	1499.6	11.644	13.952	12.944	12.567	9.471	16.67	89.02	2.123 - 8	-7.673	2.837 -12	-11.5471
520	1499.7	11.550	13.906	12.863	12.556	9.468	16.55	89.94	1.898	-7.722	2.519	-11.5988
530	1499.7	11.457	13.859	12.781	12.544	9.465	16.43	90.85	1.699	-7.770	2.239	-11.6500
540	1499.8	11.364	13.812	12.699	12.532	9.462	16.31	91.77	1.523	-7.817	1.992	-11.7006
550	1499.8	11.271	13.766	12.618	12.521	9.459	16.20	92.68	1.367	-7.864	1.775	-11.7508
560	1499.9	11.179	13.720	12.537	12.509	9.456	16.08	93.60	1.227	-7.911	1.583	-11.8005
570	1499.9	11.087	13.674	12.457	12.498	9.454	15.97	94.53	1.104	-7.957	1.414	-11.8497
580	1499.9	10.995	13.628	12.376	12.486	9.451	15.86	95.47	9.934 - 9	-8.003	1.263	-11.8984
590	1499.9	10.903	13.582	12.296	12.475	9.448	15.75	96.43	8.951	-8.048	1.130	-11.9468
600	1499.9	10.812	13.536	12.216	12.463	9.445	15.64	97.40	8.073	-8.093	1.012	-11.9947
610	1499.9	10.721	13.491	12.136	12.452	9.442	15.52	98.39	7.289 - 9	-8.137	9.074 -13	-12.0422
620	1500.0	10.630	13.445	12.057	12.441	9.439	15.41	99.41	6.588	-8.181	8.141	-12.0893
630	1500.0	10.539	13.400	11.977	12.429	9.436	15.29	100.45	5.961	-8.225	7.310	-12.1361
640	1500.0	10.449	13.355	11.898	12.418	9.433	15.18	101.53	5.399	-8.268	6.570	-12.1825
650	1500.0	10.359	13.310	11.819	12.407	9.431	15.05	102.64	4.895	-8.310	5.909	-12.2285
660	1500.0	10.269	13.265	11.741	12.395	9.428	14.93	103.78	4.443	-8.352	5.319	-12.2742
670	1500.0	10.179	13.220	11.662	12.384	9.425	14.80	104.98	4.037	-8.394	4.792	-12.3195
680	1500.0	10.090	13.175	11.584	12.373	9.422	14.67	106.22	3.672	-8.435	4.320	-12.3645
690	1500.0	10.001	13.131	11.506	12.362	9.419	14.54	107.51	3.344	-8.476	3.898	-12.4091
700	1500.0	9.912	13.086	11.428	12.351	9.417	14.40	108.86	3.049	-8.516	3.520	-12.4535
710	1500.0	9.824	13.042	11.351	12.340	9.414	14.25	110.27	2.783 - 9	-8.555	3.181 -13	-12.4975
720	1500.0	9.735	12.998	11.274	12.329	9.411	14.11	111.74	2.543	-8.595	2.876	-12.5411
730	1500.0	9.647	12.954	11.197	12.318	9.408	13.95	113.29	2.327	-8.633	2.603	-12.5845
740	1500.0	9.560	12.910	11.120	12.307	9.405	13.79	114.91	2.132	-8.671	2.358	-12.6275
750	1500.0	9.472	12.866	11.043	12.296	9.403	13.63	116.61	1.955	-8.709	2.137	-12.6702
760	1500.0	9.385	12.823	10.967	12.285	9.400	13.46	118.40	1.796	-8.746	1.938	-12.7125
770	1500.0	9.298	12.779	10.890	12.274	9.397	13.29	120.28	1.651	-8.782	1.760	-12.7546
780	1500.0	9.211	12.736	10.814	12.263	9.394	13.11	122.26	1.521	-8.818	1.599	-12.7962
790	1500.0	9.124	12.692	10.739	12.252	9.392	12.93	124.34	1.402	-8.853	1.454	-12.8376
800	1500.0	9.038	12.649	10.663	12.241	9.389	12.74	126.53	1.295	-8.888	1.323	-12.8786
820	1500.0	8.866	12.563	10.513	12.220	9.384	12.35	131.26	1.109 - 9	-8.955	1.098 -13	-12.9595
840	1500.0	8.695	12.478	10.363	12.199	9.378	11.94	136.48	9.547 -10	-9.020	9.143 -14	-13.0389
860	1500.0	8.356	12.308	10.066	12.156	9.368	11.09	148.59	7.207	-9.142	6.610	-13.1931
900	1500.0	8.188	12.224	9.919	12.135	9.362	10.66	155.54	6.318	-9.199	5.398	-13.2678
920	1500.0	8.020	12.141	9.772	12.114	9.357	10.22	163.13	5.572	-9.254	4.565	-13.3406
940	1500.0	7.854	12.057	9.627	12.093	9.352	9.78	171.37	4.944	-9.306	3.876	-13.4116
960	1500.0	7.689	11.975	9.482	12.073	9.346	9.35	180.28	4.412	-9.355	3.306	-13.4806
980	1500.0	7.524	11.892	9.338	12.052	9.341	8.92	189.83	3.960	-9.402	2.834	-13.5477
1000	1500.0	7.361	11.811	9.195	12.032	9.336	8.52	200.02	3.574	-9.447	2.440	-13.6126

SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 1700° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
120	355.0	16.875	16.881	17.602	13.531		26.90	11.62	2.700 - 5	-4.569	2.461 - 8	-7.6089
125	467.3	16.563	16.665	17.314	13.433		26.59	15.49	1.864	-4.730	1.275	-7.8943
130	570.3	16.324	16.503	17.094	13.361		26.33	19.12	1.395	-4.855	7.746 - 9	-8.1109
135	664.6	16.130	16.372	16.916	13.304		26.09	22.52	1.097	-4.960	5.179	-8.2857
140	751.1	15.966	16.264	16.766	13.257		25.87	25.71	8.914 - 6	-5.050	3.693	-8.4326
145	830.3	15.824	16.171	16.636	13.217		25.67	28.69	7.416	-5.130	2.757	-8.5595
150	903.0	15.697	16.089	16.520	13.183		25.47	31.49	6.281	-5.202	2.131	-8.6714
155	969.5	15.583	16.016	16.416	13.154		25.29	34.11	5.393 - 6	-5.268	1.692 - 9	-8.7717
160	1030.5	15.478	15.951	16.321	13.128		25.11	36.57	4.681	-5.330	1.372	-8.8627
165	1086.4	15.381	15.891	16.234	13.104		24.93	38.89	4.100	-5.387	1.132	-8.9462
170	1137.7	15.291	15.836	16.153	13.083		24.76	41.06	3.618	-5.441	9.473 -10	-9.0235
175	1184.6	15.207	15.785	16.077	13.064		24.60	43.11	3.213	-5.493	8.024	-9.0956
180	1227.7	15.127	15.737	16.005	13.046		24.44	45.04	2.869	-5.542	6.867	-9.1632
185	1267.1	15.051	15.693	15.937	13.030		24.28	46.87	2.573	-5.590	5.928	-9.2271
190	1303.3	14.979	15.650	15.872	13.015		24.12	48.59	2.317	-5.635	5.157	-9.2876
195	1336.4	14.910	15.610	15.810	13.001		23.96	50.23	2.094	-5.679	4.516	-9.3452
200	1366.8	14.843	15.572	15.750	12.988		23.81	51.78	1.899	-5.722	3.978	-9.4004
205	1394.6	14.778	15.535	15.692	12.975		23.66	53.25	1.726 - 6	-5.763	3.522 -10	-9.4532
210	1420.1	14.716	15.500	15.637	12.963		23.51	54.66	1.573	-5.803	3.133	-9.5041
215	1443.5	14.655	15.466	15.583	12.952		23.36	55.99	1.437	-5.842	2.798	-9.5532
220	1464.9	14.596	15.434	15.530	12.942		23.21	57.27	1.316	-5.881	2.508	-9.6007
225	1484.5	14.538	15.402	15.479	12.932		23.07	58.49	1.207	-5.918	2.256	-9.6467
230	1502.5	14.482	15.371	15.429	12.922		22.92	59.67	1.109	-5.955	2.035	-9.6914
235	1519.0	14.427	15.341	15.380	12.913		22.78	60.79	1.021	-5.991	1.841	-9.7349
240	1534.1	14.373	15.312	15.332	12.904		22.64	61.88	9.409 - 7	-6.026	1.670	-9.7773
245	1548.0	14.319	15.283	15.285	12.895		22.50	62.92	8.684	-6.061	1.518	-9.8187
250	1560.7	14.267	15.255	15.239	12.887		22.36	63.93	8.026	-6.095	1.383	-9.8592
255	1572.3	14.215	15.228	15.193	12.879		22.22	64.91	7.427 - 7	-6.129	1.262 -10	-9.8989
260	1583.0	14.164	15.201	15.148	12.871		22.08	65.85	6.880	-6.162	1.154	-9.9377
265	1592.8	14.114	15.174	15.104	12.863		21.95	66.77	6.380	-6.195	1.057	-9.9758
270	1601.7	14.065	15.148	15.060	12.856		21.81	67.66	5.923	-6.227	9.701 -11	-10.0132
275	1609.9	14.015	15.123	15.017	12.849		21.68	68.53	5.504	-6.259	8.913	-10.0500
280	1617.4	13.967	15.097	14.974	12.842		21.54	69.38	5.119	-6.291	8.201	-10.0861
285	1624.3	13.919	15.072	14.932	12.835		21.41	70.21	4.765	-6.322	7.555	-10.1217
290	1630.7	13.871	15.048	14.889	12.828		21.28	71.02	4.439	-6.353	6.969	-10.1568
295	1636.4	13.823	15.023	14.848	12.821		21.16	71.81	4.139	-6.383	6.436	-10.1914
300	1641.8	13.776	14.999	14.806	12.815		21.03	72.59	3.862	-6.413	5.950	-10.2255
310	1651.1	13.683	14.951	14.725	12.802		20.78	74.10	3.370 - 7	-6.472	5.101 -11	-10.2923
320	1658.9	13.591	14.904	14.644	12.789		20.54	75.55	2.948	-6.530	4.390	-10.3575
330	1665.5	13.500	14.858	14.564	12.777		20.30	76.97	2.586	-6.587	3.791	-10.4212
340	1671.0	13.410	14.812	14.485	12.765		20.07	78.35	2.274	-6.643	3.284	-10.4836
350	1675.6	13.321	14.767	14.407	12.753		19.85	79.69	2.003	-6.698	2.854	-10.5446
360	1679.5	13.232	14.722	14.329	12.742		19.63	81.00	1.769	-6.752	2.486	-10.6044
370	1682.8	13.144	14.677	14.252	12.730		19.42	82.28	1.565	-6.805	2.172	-10.6631
380	1685.6	13.057	14.633	14.175	12.719		19.22	83.53	1.387	-6.858	1.902	-10.7208
390	1687.9	12.970	14.590	14.099	12.708		19.02	84.76	1.232	-6.909	1.669	-10.7775
400	1689.8	12.883	14.546	14.023	12.697		18.83	85.96	1.096	-6.960	1.468	-10.8332

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
410	1691.4	12.797	14.503	12.948	12.686		18.65	87.15	9.761 - 8	-7.011	1.294 -11	-10.8880
420	1692.8	12.711	14.460	13.872	12.675		18.47	88.31	8.709	-7.060	1.143	-10.9420
430	1694.0	12.626	14.417	13.798	12.664		18.30	89.45	7.782	-7.109	1.011	-10.9951
440	1694.9	12.541	14.374	13.723	12.653		18.14	90.57	6.964	-7.157	8.954 -12	-11.0475
450	1695.7	12.456	14.332	13.649	12.643		17.98	91.67	6.240	-7.205	7.959	-11.0991
460	1696.4	12.372	14.290	13.575	12.632		17.83	92.75	5.599	-7.252	7.078	-11.1501
470	1697.0	12.288	14.248	13.502	12.621		17.69	93.82	5.030	-7.298	6.305	-11.2003
480	1697.5	12.204	14.206	13.428	12.611		17.55	94.87	4.524	-7.344	5.625	-11.2499
490	1697.9	12.121	14.164	13.355	12.600		17.41	95.91	4.074	-7.390	5.025	-11.2989
500	1698.2	12.038	14.122	13.282	12.590	9.249	17.28	96.93	3.672	-7.435	4.495	-11.3473
510	1698.5	11.955	14.081	13.210	12.580	9.246	17.16	97.94	3.314 - 8	-7.480	4.026 -12	-11.3951
520	1698.7	11.872	14.039	13.138	12.569	9.244	17.04	98.94	2.994	-7.524	3.611	-11.4423
530	1698.9	11.790	13.998	13.065	12.559	9.241	16.92	99.93	2.708	-7.567	3.243	-11.4891
540	1699.1	11.708	13.957	12.994	12.549	9.238	16.80	100.91	2.451	-7.611	2.915	-11.5353
550	1699.3	11.626	13.916	12.922	12.538	9.236	16.69	101.89	2.221	-7.653	2.624	-11.5810
560	1699.4	11.544	13.875	12.850	12.528	9.233	16.58	102.86	2.014	-7.696	2.364	-11.6263
570	1699.5	11.463	13.835	12.779	12.518	9.231	16.48	103.82	1.828	-7.738	2.132	-11.6712
580	1699.6	11.382	13.794	12.708	12.508	9.228	16.37	104.79	1.661	-7.780	1.925	-11.7156
590	1699.6	11.301	13.754	12.637	12.498	9.225	16.27	105.76	1.511	-7.821	1.740	-11.7596
600	1699.7	11.220	13.713	12.567	12.488	9.223	16.17	106.73	1.375	-7.862	1.573	-11.8032
610	1699.7	11.140	13.673	12.496	12.477	9.220	16.07	107.70	1.253 - 8	-7.902	1.424 -12	-11.8464
620	1699.8	11.059	13.633	12.426	12.467	9.218	15.97	108.69	1.142	-7.942	1.291	-11.8892
630	1699.8	10.980	13.593	12.356	12.457	9.215	15.87	109.68	1.042	-7.982	1.170	-11.9317
640	1699.8	10.900	13.553	12.286	12.447	9.213	15.77	110.69	9.516 - 9	-8.022	1.062	-11.9738
650	1699.9	10.820	13.513	12.217	12.437	9.210	15.67	111.71	8.698	-8.061	9.646 -13	-12.0156
660	1699.9	10.741	13.474	12.147	12.428	9.208	15.58	112.75	7.956	-8.099	8.768	-12.0571
670	1699.9	10.662	13.434	12.078	12.418	9.205	15.47	113.80	7.284	-8.138	7.975	-12.0983
680	1699.9	10.583	13.395	12.009	12.408	9.203	15.37	114.88	6.674	-8.176	7.259	-12.1391
690	1699.9	10.505	13.356	11.940	12.398	9.200	15.27	115.99	6.120	-8.213	6.612	-12.1797
700	1699.9	10.426	13.316	11.872	12.388	9.198	15.16	117.12	5.617	-8.251	6.026	-12.2199
710	1700.0	10.348	13.277	11.803	12.378	9.195	15.06	118.29	5.159 - 9	-8.287	5.497 -13	-12.2599
720	1700.0	10.270	13.238	11.735	12.369	9.193	14.95	119.49	4.743	-8.324	5.017	-12.2996
730	1700.0	10.193	13.199	11.667	12.359	9.190	14.84	120.73	4.364	-8.360	4.581	-12.3390
740	1700.0	10.115	13.161	11.599	12.349	9.188	14.72	122.01	4.019	-8.396	4.187	-12.3781
750	1700.0	10.038	13.122	11.532	12.340	9.186	14.61	123.33	3.704	-8.431	3.828	-12.4170
760	1700.0	9.961	13.084	11.464	12.330	9.183	14.49	124.70	3.417	-8.466	3.503	-12.4556
770	1700.0	9.884	13.045	11.397	12.320	9.181	14.36	126.12	3.155	-8.501	3.207	-12.4939
780	1700.0	9.807	13.007	11.330	12.311	9.178	14.24	127.60	2.916	-8.535	2.938	-12.5320
790	1700.0	9.731	12.969	11.263	12.301	9.176	14.11	129.13	2.698	-8.569	2.693	-12.5698
800	1700.0	9.655	12.931	11.196	12.292	9.173	13.98	130.72	2.498	-8.602	2.470	-12.6074
820	1700.0	9.503	12.855	11.064	12.273	9.169	13.70	134.11	2.148 - 9	-8.668	2.081 -13	-12.6817
840	1700.0	9.352	12.779	10.931	12.254	9.164	13.41	137.80	1.854	-8.732	1.758	-12.7549
860	1700.0	9.053	12.630	10.670	12.216	9.155	12.78	146.18	1.398	-8.854	1.264	-12.8982
900	1700.0	8.905	12.555	10.540	12.198	9.150	12.44	150.94	1.222	-8.913	1.076	-12.9682
920	1700.0	8.757	12.482	10.410	12.179	9.145	12.10	156.12	1.073	-8.970	9.181 -14	-13.0371
940	1700.0	8.610	12.408	10.282	12.161	9.141	11.74	161.76	9.458 -10	-9.024	7.856	-13.1048
960	1700.0	8.464	12.335	10.154	12.143	9.136	11.37	167.88	8.377	-9.077	6.741	-13.1713
980	1700.0	8.319	12.263	10.027	12.125	9.131	11.00	174.52	7.453	-9.128	5.801	-13.2365
1000	1700.0	8.175	12.191	9.901	12.107	9.127	10.63	181.69	6.661	-9.176	5.007	-13.3004

SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 1900° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
120	355.0	16.875	16.881	17.602	13.531		26.90	11.62	2.700 - 5	-4.569	2.461 - 8	-7.6089
125	467.1	16.563	16.665	17.314	13.433		26.59	15.48	1.863	-4.730	1.276	-7.8942
130	571.0	16.324	16.502	17.094	13.360		26.33	19.15	1.395	-4.855	7.735 - 9	-8.1115
135	667.4	16.129	16.371	16.915	13.302		26.09	22.62	1.097	-4.960	5.160	-8.2873
140	756.8	15.964	16.261	16.763	13.255		25.87	25.90	8.929 - 6	-5.049	3.672	-8.4352
145	839.7	15.821	16.167	16.632	13.215		25.67	29.01	7.442	-5.128	2.736	-8.5628
150	916.6	15.693	16.084	16.516	13.180		25.48	31.96	6.316	-5.200	2.111	-8.6754
155	988.0	15.579	16.010	16.412	13.149		25.30	34.75	5.436 - 6	-5.265	1.674 - 9	-8.7762
160	1054.1	15.474	15.944	16.317	13.122		25.12	37.39	4.732	-5.325	1.356	-8.8676
165	1115.5	15.378	15.884	16.229	13.098		24.95	39.90	4.158	-5.381	1.119	-8.9513
170	1172.4	15.288	15.828	16.148	13.076		24.79	42.27	3.682	-5.434	9.362 -10	-9.0286
175	1225.1	15.204	15.776	16.072	13.056		24.63	44.53	3.281	-5.484	7.933	-9.1006
180	1274.1	15.125	15.728	16.001	13.038		24.47	46.68	2.940	-5.532	6.792	-9.1680
185	1319.5	15.050	15.683	15.933	13.021		24.32	48.72	2.648	-5.577	5.869	-9.2314
190	1361.6	14.979	15.641	15.869	13.005		24.17	50.66	2.394	-5.621	5.111	-9.2915
195	1400.7	14.911	15.601	15.808	12.991		24.02	52.52	2.173	-5.663	4.482	-9.3485
200	1436.9	14.845	15.562	15.749	12.977		23.87	54.29	1.979	-5.704	3.955	-9.4029
205	1470.5	14.782	15.526	15.693	12.964		23.73	55.98	1.807 - 6	-5.743	3.508 -10	-9.4549
210	1501.6	14.722	15.491	15.639	12.952		23.59	57.59	1.655	-5.781	3.127	-9.5048
215	1530.5	14.663	15.457	15.586	12.941		23.45	59.14	1.519	-5.818	2.800	-9.5529
220	1557.3	14.605	15.425	15.535	12.930		23.31	60.62	1.398	-5.855	2.516	-9.5992
225	1582.2	14.550	15.394	15.486	12.919		23.18	62.05	1.288	-5.890	2.270	-9.6441
230	1605.2	14.496	15.363	15.437	12.910		23.04	63.42	1.190	-5.925	2.054	-9.6875
235	1626.6	14.443	15.334	15.390	12.900		22.91	64.73	1.100	-5.959	1.864	-9.7296
240	1646.4	14.391	15.305	15.344	12.891		22.78	66.00	1.019	-5.992	1.696	-9.7706
245	1664.8	14.340	15.278	15.299	12.882		22.64	67.23	9.455 - 7	-6.024	1.547	-9.8105
250	1681.9	14.290	15.251	15.255	12.874		22.52	68.41	8.783	-6.056	1.414	-9.8495
255	1697.7	14.241	15.224	15.212	12.866		22.39	69.56	8.169 - 7	-6.088	1.296 -10	-9.8875
260	1712.4	14.193	15.198	15.169	12.858		22.26	70.66	7.607	-6.119	1.189	-9.9247
265	1726.0	14.146	15.173	15.127	12.850		22.13	71.74	7.091	-6.149	1.094	-9.9611
270	1738.6	14.099	15.148	15.086	12.843		22.01	72.78	6.617	-6.179	1.008	-9.9967
275	1750.3	14.053	15.123	15.045	12.836		21.89	73.80	6.181	-6.209	9.296 -11	-10.0317
280	1761.2	14.007	15.099	15.005	12.829		21.76	74.79	5.779	-6.238	8.589	-10.0661
285	1771.2	13.962	15.076	14.965	12.822		21.64	75.75	5.407	-6.267	7.947	-10.0998
290	1780.6	13.918	15.052	14.926	12.815		21.52	76.69	5.064	-6.296	7.362	-10.1330
295	1789.2	13.874	15.029	14.887	12.808		21.40	77.60	4.746	-6.324	6.829	-10.1657
300	1797.3	13.830	15.006	14.849	12.802		21.29	78.50	4.452	-6.351	6.342	-10.1978
310	1811.6	13.744	14.961	14.773	12.790		21.06	80.24	3.925 - 7	-6.406	5.486 -11	-10.2607
320	1824.0	13.659	14.918	14.698	12.777		20.83	81.90	3.469	-6.460	4.765	-10.3219
330	1834.6	13.576	14.874	14.625	12.766		20.61	83.51	3.074	-6.512	4.154	-10.3816
340	1843.8	13.493	14.832	14.552	12.754		20.39	85.07	2.730	-6.564	3.632	-10.4398
350	1851.6	13.411	14.790	14.480	12.743		20.18	86.58	2.430	-6.614	3.186	-10.4967
360	1858.4	13.331	14.749	14.410	12.732		19.98	88.04	2.167	-6.664	2.802	-10.5525
370	1864.2	13.250	14.708	14.339	12.722		19.78	89.47	1.936	-6.713	2.471	-10.6071
380	1869.2	13.171	14.668	14.269	12.711		19.59	90.87	1.733	-6.761	2.184	-10.6607
390	1873.5	13.092	14.628	14.200	12.701		19.40	92.23	1.554	-6.809	1.935	-10.7133
400	1877.2	13.014	14.589	14.132	12.691		19.22	93.56	1.395	-6.855	1.718	-10.7650

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
410	1880.4	12.936	14.549	14.063	12.680		19.04	94.87	1.255 - 7	-6.901	1.528 -11	-10.8158
420	1883.1	12.859	14.510	13.996	12.670		18.87	96.15	1.130	-6.947	1.362	-10.8658
430	1885.5	12.782	14.471	13.928	12.661		18.71	97.41	1.019	-6.992	1.216	-10.9151
440	1887.5	12.705	14.433	13.861	12.651		18.55	98.64	9.202 - 8	-7.036	1.088	-10.9635
450	1889.3	12.629	14.395	13.794	12.641		18.39	99.85	8.320	-7.080	9.743 -12	-11.0113
460	1890.8	12.553	14.357	13.728	12.631		18.24	101.04	7.532	-7.123	8.741	-11.0584
470	1892.1	12.477	14.319	13.662	12.622		18.10	102.22	6.826	-7.166	7.854	-11.1049
480	1893.2	12.402	14.281	13.596	12.612		17.96	103.37	6.193	-7.208	7.067	-11.1508
490	1894.1	12.327	14.243	13.530	12.603		17.83	104.51	5.625	-7.250	6.368	-11.1960
500	1894.9	12.253	14.206	13.465	12.593	9.077	17.70	105.63	5.115	-7.291	5.745	-11.2407
510	1895.7	12.178	14.169	13.400	12.584	9.075	17.57	106.73	4.655 - 8	-7.332	5.189 -12	-11.2849
520	1896.3	12.104	14.131	13.335	12.575	9.072	17.45	107.82	4.241	-7.373	4.693	-11.3285
530	1896.8	12.030	14.094	13.270	12.565	9.070	17.33	108.90	3.867	-7.413	4.250	-11.3716
540	1897.2	11.957	14.058	13.206	12.556	9.067	17.22	109.97	3.529	-7.452	3.852	-11.4143
550	1897.6	11.883	14.021	13.141	12.547	9.065	17.11	111.03	3.224	-7.492	3.495	-11.4565
560	1898.0	11.810	13.984	13.077	12.538	9.063	17.00	112.07	2.947	-7.531	3.175	-11.4982
570	1898.2	11.737	13.948	13.013	12.528	9.060	16.89	113.11	2.697	-7.569	2.887	-11.5396
580	1898.5	11.665	13.911	12.950	12.519	9.058	16.79	114.14	2.470	-7.607	2.627	-11.5805
590	1898.7	11.592	13.875	12.886	12.510	9.056	16.69	115.17	2.263	-7.645	2.393	-11.6210
600	1898.9	11.520	13.839	12.823	12.501	9.053	16.60	116.19	2.076	-7.683	2.182	-11.6611
610	1899.0	11.448	13.803	12.760	12.492	9.051	16.50	117.21	1.905 - 8	-7.720	1.991 -12	-11.7009
620	1899.2	11.376	13.767	12.697	12.483	9.049	16.41	118.23	1.750	-7.757	1.819	-11.7403
630	1899.3	11.305	13.731	12.635	12.474	9.046	16.31	119.24	1.609	-7.793	1.662	-11.7793
640	1899.4	11.233	13.696	12.572	12.465	9.044	16.22	120.27	1.480	-7.830	1.520	-11.8181
650	1899.5	11.162	13.660	12.510	12.456	9.042	16.13	121.29	1.362	-7.866	1.392	-11.8565
660	1899.5	11.091	13.625	12.448	12.447	9.040	16.04	122.32	1.255	-7.901	1.275	-11.8946
670	1899.6	11.020	13.589	12.386	12.439	9.037	15.95	123.36	1.157	-7.937	1.169	-11.9324
680	1899.7	10.950	13.554	12.325	12.430	9.035	15.86	124.41	1.067	-7.972	1.072	-11.9699
690	1899.7	10.879	13.519	12.262	12.421	9.033	15.77	125.47	9.851 - 9	-8.007	9.839 -13	-12.0071
700	1899.8	10.809	13.484	12.201	12.412	9.031	15.69	126.54	9.100	-8.041	9.037	-12.0440
710	1899.8	10.739	13.449	12.140	12.403	9.028	15.60	127.63	8.411 - 9	-8.075	8.305 -13	-12.0807
720	1899.8	10.670	13.414	12.079	12.395	9.026	15.51	128.74	7.780	-8.109	7.637	-12.1171
730	1899.8	10.600	13.379	12.018	12.386	9.024	15.42	129.87	7.201	-8.143	7.027	-12.1532
740	1899.9	10.531	13.344	11.957	12.377	9.022	15.32	131.01	6.669	-8.176	6.470	-12.1891
750	1899.9	10.462	13.310	11.897	12.369	9.020	15.23	132.19	6.181	-8.209	5.960	-12.2247
760	1899.9	10.393	13.275	11.836	12.360	9.018	15.14	133.39	5.733	-8.242	5.493	-12.2602
770	1899.9	10.324	13.241	11.776	12.351	9.015	15.04	134.61	5.321	-8.274	5.066	-12.2953
780	1899.9	10.256	13.207	11.716	12.343	9.013	14.94	135.87	4.941	-8.306	4.675	-12.3303
790	1899.9	10.187	13.173	11.656	12.334	9.011	14.84	137.16	4.592	-8.338	4.315	-12.3650
800	1899.9	10.119	13.139	11.597	12.326	9.009	14.74	138.49	4.271	-8.369	3.986	-12.3995
820	1900.0	9.983	13.071	11.478	12.309	9.005	14.53	141.27	3.702 - 9	-8.432	3.406 -13	-12.4677
840	1900.0	9.848	13.003	11.360	12.292	9.000	14.32	144.22	3.218	-8.492	2.916	-12.5352
860	1900.0	9.581	12.869	11.125	12.258	8.992	13.85	150.74	2.453	-8.610	2.151	-12.6674
900	1900.0	9.448	12.803	11.009	12.242	8.988	13.60	154.36	2.152	-8.667	1.852	-12.7323
920	1900.0	9.316	12.737	10.894	12.225	8.984	13.34	158.24	1.893	-8.723	1.599	-12.7963
940	1900.0	9.184	12.671	10.779	12.209	8.979	13.07	162.42	1.671	-8.777	1.382	-12.8594
960	1900.0	9.054	12.606	10.664	12.193	8.975	12.79	166.92	1.480	-8.830	1.198	-12.9216
980	1900.0	8.924	12.541	10.551	12.176	8.971	12.49	171.76	1.315	-8.881	1.040	-12.9830
1000	1900.0	8.795	12.476	10.437	12.160	8.967	12.19	176.98	1.172	-8.931	9.048 -14	-13.0434

SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 2100° K

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log n(He)	log n(H)						
120	355.0	16.875	16.881	17.602	13.531		26.90	11.62	2.700 - 5	-4.569	2.461 - 8	-7.6089
125	467.6	16.563	16.665	17.314	13.433		26.59	15.50	1.864	-4.730	1.275	-7.8946
130	573.0	16.323	16.501	17.093	13.359		26.33	19.21	1.398	-4.855	7.715 - 9	-8.1127
135	671.5	16.127	16.368	16.913	13.301		26.09	22.76	1.100	-4.959	5.139	-8.2891
140	763.7	15.962	16.258	16.761	13.253		25.88	26.14	8.960 - 6	-5.048	3.651	-8.4375
145	850.0	15.818	16.163	16.630	13.212		25.68	29.36	7.481	-5.126	2.718	-8.5657
150	930.6	15.691	16.079	16.513	13.176		25.49	32.43	6.363	-5.196	2.096	-8.6786
155	1006.1	15.576	16.005	16.409	13.145		25.31	35.37	5.490 - 6	-5.260	1.661 - 9	-8.7796
160	1076.7	15.472	15.938	16.314	13.117		25.14	38.17	4.792	-5.319	1.346	-8.8711
165	1142.8	15.376	15.877	16.226	13.093		24.97	40.84	4.227	-5.374	1.110	-8.9546
170	1204.5	15.287	15.821	16.145	13.070		24.81	43.39	3.750	-5.426	9.290 -10	-9.0320
175	1262.3	15.203	15.769	16.070	13.050		24.66	45.83	3.352	-5.475	7.875	-9.1037
180	1316.4	15.125	15.721	15.999	13.031		24.51	48.16	3.014	-5.521	6.748	-9.1708
185	1367.0	15.051	15.676	15.932	13.014		24.36	50.39	2.723	-5.565	5.836	-9.2339
190	1414.3	14.981	15.633	15.869	12.997		24.21	52.52	2.471	-5.607	5.088	-9.2934
195	1458.5	14.913	15.593	15.808	12.982		24.07	54.57	2.251	-5.648	4.468	-9.3499
200	1499.9	14.849	15.555	15.750	12.968		23.93	56.53	2.057	-5.687	3.948	-9.4036
205	1538.7	14.787	15.519	15.695	12.955		23.80	58.41	1.886 - 6	-5.725	3.508 -10	-9.4550
210	1574.9	14.728	15.484	15.642	12.943		23.66	60.21	1.733	-5.761	3.132	-9.5042
215	1608.8	14.670	15.450	15.590	12.931		23.53	61.95	1.597	-5.797	2.809	-9.5514
220	1640.5	14.615	15.418	15.541	12.920		23.40	63.62	1.475	-5.831	2.530	-9.5969
225	1670.1	14.561	15.387	15.492	12.909		23.27	65.23	1.365	-5.865	2.287	-9.6407
230	1697.9	14.508	15.358	15.445	12.899		23.15	66.78	1.265	-5.898	2.074	-9.6832
235	1723.8	14.457	15.329	15.400	12.889		23.02	68.27	1.175	-5.930	1.887	-9.7243
240	1748.1	14.407	15.301	15.355	12.880		22.90	69.71	1.093	-5.962	1.721	-9.7642
245	1770.8	14.358	15.273	15.312	12.871		22.77	71.11	1.018	-5.992	1.574	-9.8029
250	1792.1	14.311	15.247	15.269	12.863		22.65	72.46	9.493 - 7	-6.023	1.443	-9.8407
255	1811.9	14.264	15.221	15.228	12.854		22.53	73.76	8.866 - 7	-6.052	1.326 -10	-9.8775
260	1830.5	14.218	15.196	15.187	12.847		22.41	75.03	8.290	-6.081	1.221	-9.9134
265	1847.9	14.173	15.171	15.147	12.839		22.29	76.26	7.759	-6.110	1.126	-9.9485
270	1864.2	14.128	15.147	15.107	12.831		22.18	77.45	7.271	-6.138	1.040	-9.9828
275	1879.4	14.084	15.124	15.069	12.824		22.06	78.61	6.819	-6.166	9.628 -11	-10.0164
280	1893.6	14.041	15.100	15.031	12.817		21.95	79.74	6.402	-6.194	8.925	-10.0494
285	1907.0	13.999	15.077	14.993	12.810		21.83	80.83	6.016	-6.221	8.285	-10.0817
290	1919.4	13.956	15.055	14.956	12.804		21.72	81.90	5.657	-6.247	7.701	-10.1135
295	1931.1	13.915	15.033	14.919	12.797		21.61	82.95	5.324	-6.274	7.167	-10.1447
300	1942.0	13.874	15.011	14.883	12.791		21.50	83.97	5.015	-6.300	6.678	-10.1753
310	1961.7	13.793	14.969	14.811	12.779		21.29	85.94	4.458 - 7	-6.351	5.818 -11	-10.2352
320	1979.0	13.714	14.927	14.742	12.767		21.08	87.83	3.973	-6.401	5.089	-10.2933
330	1994.1	13.636	14.886	14.673	12.755		20.87	89.64	3.550	-6.450	4.468	-10.3499
340	2007.3	13.559	14.847	14.605	12.744		20.67	91.39	3.179	-6.498	3.936	-10.4049
350	2018.9	13.483	14.807	14.539	12.734		20.47	93.08	2.852	-6.545	3.478	-10.4587
360	2029.0	13.408	14.769	14.473	12.723		20.28	94.72	2.564	-6.591	3.082	-10.5112
370	2037.9	13.334	14.731	14.408	12.713		20.09	96.31	2.309	-6.637	2.738	-10.5626
380	2045.7	13.261	14.694	14.344	12.703		19.91	97.86	2.083	-6.681	2.438	-10.6130
390	2052.4	13.189	14.657	14.280	12.693		19.73	99.37	1.882	-6.725	2.176	-10.6623
400	2058.4	13.117	14.620	14.217	12.684		19.55	100.84	1.703	-6.769	1.946	-10.7108

Altitude Z, km	Temp. T, °K	Number density m^{-3}					Molecular weight M	Scale height H_p, km	Pressure P, mb	Log pressure	Density ρ, kg m^{-3}	Log density
		log $n(O_2)$	log $n(O)$	log $n(N_2)$	log $n(He)$	log $n(H)$						
410	2063.6	13.045	14.584	14.154	12.674		19.38	102.28	1.544 - 7	-6.811	1.744 -11	-10.7585
420	2068.1	12.974	14.548	14.092	12.665		19.22	103.68	1.401	-6.854	1.566	-10.8053
430	2072.1	12.904	14.512	14.030	12.656		19.06	105.06	1.273	-6.895	1.408	-10.8513
440	2075.6	12.834	14.477	13.969	12.646		18.90	106.42	1.158	-6.936	1.269	-10.8967
450	2078.6	12.765	14.442	13.908	12.637		18.75	107.74	1.055	-6.977	1.145	-10.9413
460	2081.3	12.695	14.407	13.847	12.629		18.61	109.05	9.618 - 8	-7.017	1.034	-10.9854
470	2083.6	12.626	14.372	13.787	12.620		18.47	110.33	8.780	-7.056	9.359 -12	-11.0287
480	2085.7	12.558	14.338	13.727	12.611		18.33	111.59	8.024	-7.096	8.481	-11.0716
490	2087.5	12.490	14.303	13.667	12.602		18.20	112.83	7.340	-7.134	7.695	-11.1138
500	2089.0	12.422	14.269	13.608	12.594	8.945	18.07	114.05	6.720	-7.173	6.991	-11.1555
510	2090.4	12.354	14.235	13.548	12.585	8.943	17.94	115.26	6.159 - 8	-7.210	6.358 -12	-11.1967
520	2091.6	12.287	14.202	13.489	12.576	8.941	17.82	116.45	5.650	-7.248	5.790	-11.2373
530	2092.7	12.220	14.168	13.431	12.568	8.939	17.70	117.62	5.187	-7.285	5.278	-11.2775
540	2093.6	12.153	14.135	13.372	12.559	8.936	17.59	118.78	4.766	-7.322	4.817	-11.3173
550	2094.4	12.087	14.101	13.314	12.551	8.934	17.48	119.93	4.383	-7.358	4.400	-11.3566
560	2095.1	12.020	14.068	13.256	12.543	8.931	17.37	121.06	4.034	-7.394	4.023	-11.3954
570	2095.7	11.954	14.035	13.198	12.534	8.929	17.27	122.18	3.716	-7.430	3.682	-11.4339
580	2096.2	11.888	14.002	13.140	12.526	8.927	17.17	123.29	3.425	-7.465	3.373	-11.4719
590	2096.7	11.823	13.969	13.083	12.518	8.925	17.07	124.39	3.159	-7.500	3.093	-11.5096
600	2097.1	11.757	13.936	13.025	12.510	8.923	16.97	125.49	2.916	-7.535	2.838	-11.5469
610	2097.5	11.692	13.903	12.968	12.501	8.921	16.88	126.57	2.694 - 8	-7.570	2.607 -12	-11.5839
620	2097.8	11.627	13.871	12.911	12.493	8.919	16.78	127.65	2.490	-7.604	2.396	-11.6205
630	2098.1	11.562	13.839	12.855	12.485	8.916	16.69	128.73	2.303	-7.638	2.204	-11.6568
640	2098.3	11.497	13.806	12.798	12.477	8.914	16.60	129.80	2.132	-7.671	2.029	-11.6927
650	2098.5	11.433	13.774	12.742	12.469	8.912	16.52	130.87	1.974	-7.705	1.869	-11.7284
660	2098.7	11.369	13.742	12.685	12.461	8.910	16.43	131.94	1.830	-7.738	1.723	-11.7637
670	2098.9	11.305	13.710	12.629	12.453	8.908	16.35	133.01	1.697	-7.770	1.589	-11.7988
680	2099.0	11.241	13.678	12.573	12.445	8.906	16.26	134.08	1.574	-7.803	1.467	-11.8336
690	2099.1	11.177	13.646	12.518	12.437	8.904	16.18	135.16	1.462	-7.835	1.355	-11.8681
700	2099.2	11.114	13.614	12.462	12.429	8.902	16.10	136.24	1.358	-7.867	1.252	-11.9023
710	2099.3	11.050	13.583	12.407	12.421	8.900	16.02	137.32	1.262 - 8	-7.899	1.158 -12	-11.9362
720	2099.4	10.987	13.551	12.352	12.413	8.898	15.94	138.42	1.174	-7.930	1.072	-11.9700
730	2099.5	10.924	13.520	12.296	12.405	8.896	15.86	139.52	1.092	-7.962	9.921 -13	-12.0034
740	2099.6	10.862	13.488	12.241	12.397	8.894	15.78	140.63	1.017	-7.993	9.190	-12.0367
750	2099.6	10.799	13.457	12.187	12.389	8.892	15.70	141.76	9.474 - 9	-8.023	8.518	-12.0697
760	2099.7	10.737	13.426	12.132	12.382	8.890	15.61	142.90	8.831	-8.054	7.899	-12.1024
770	2099.7	10.675	13.395	12.078	12.374	8.888	15.53	144.06	8.237	-8.084	7.329	-12.1350
780	2099.7	10.613	13.364	12.023	12.366	8.886	15.45	145.23	7.686	-8.114	6.803	-12.1673
790	2099.8	10.551	13.333	11.969	12.358	8.884	15.37	146.42	7.177	-8.144	6.318	-12.1994
800	2099.8	10.489	13.302	11.915	12.351	8.882	15.28	147.63	6.705	-8.174	5.870	-12.2313
820	2099.8	10.366	13.240	11.808	12.335	8.878	15.12	150.13	5.862 - 9	-8.232	5.075 -13	-12.2945
840	2099.9	10.244	13.179	11.701	12.320	8.875	14.94	152.73	5.137	-8.289	4.396	-12.3570
860	2099.9	10.002	13.058	11.489	12.290	8.867	14.57	158.32	3.972	-8.401	3.315	-12.4795
900	2099.9	9.882	12.998	11.383	12.275	8.863	14.38	161.34	3.504	-8.455	2.886	-12.5396
920	2100.0	9.762	12.938	11.279	12.260	8.859	14.18	164.53	3.100	-8.509	2.517	-12.5991
940	2100.0	9.643	12.879	11.175	12.245	8.856	13.97	167.91	2.748	-8.561	2.199	-12.6578
960	2100.0	9.525	12.820	11.071	12.230	8.852	13.75	171.49	2.443	-8.612	1.924	-12.7158
980	2100.0	9.408	12.761	10.969	12.215	8.848	13.53	175.31	2.176	-8.662	1.686	-12.7730
1000	2100.0	9.291	12.703	10.866	12.201	8.845	13.29	179.37	1.944	-8.711	1.480	-12.8296

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CORRIGENDA

for

U.S. STANDARD ATMOSPHERE, 1962

1. Page 5, Table 1.2.1

   Change Metric value of R^* to 8.31432×10^3 joules $(°K)^{-1}$ $(kg\text{-}mol)^{-1}$

   Change English value of R^* to 1545.31 ft lbf $(°R)^{-1}$ $(lb\text{-}mol)^{-1}$
   or 49719.0 lb ft^2 sec^{-2} $(°R)^{-1}$ $(lb\text{-}mol)^{-1}$

2. Page 9, Right-hand column, line 16:

   Change "1948" to read "1947"

3. Page 10, Table 1.2.8

   Change dimension of M_0 from "(dimensionless)" to "kg $(kg\text{-}mol)^{-1}$" and "lb $(lb\text{-}mol)^{-1}$"

4. Page 13, Figure 1.3.5, abscissa label:

   Change "Mean free path, km" to read "Mean free path, m."

5. Page 16, Table 1.4(e), $Z = 170$, 190, 230 km.

   Change "26.40, 24.70, 1103.4, 1205.4, 1322.3" to read "26.45, 24.69, 1105.5, 1205.5, 1321.7," respectively.

6. Page 28, Table II.3(b), integrals:

   Change "$\log_e (Z - 284.01768)$" in line 9 and "$\log_e (Z - 216.23225)$" in line 14 to read "$\log_e (284.01768 - Z)$, $\log_e (216.23225 - Z)$," respectively.

NOTE: Pages 80 through 85 and 182 through 189.—For molecular weight above 90 km minor oscillations will sometimes be noted which cause certain values to be slightly greater than a preceding value at a lower altitude. These discrepancies result from the particular analytic function utilized to fit predetermined defining points and are not intentional. Several of the figures on pages 11 to 15 show oscillations which do not appear in the tabulated values.